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CELLULOSE-WATER RELATIONS:

A SELECTED BIBLIOGRAPHY WITH SPECIAL REFERENCE TO SWELLING OF COTTON AND TO ITS UTILIZATION IN WATER-RESISTANT FABRICS

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References in this annotated bibliography are classified under five headings and are arranged first chronologically and then alphabetically by author. The period 1917 to July 1946 is covered. Items marked with an asterisk (*) have not been examined. Call numbers following the citations are those of the United States Department of Agriculture Library unless otherwise noted. Abbreviations used are those in the United States Department of Agriculture Miscellaneous Publication 334, Abbreviations Used in the Department of Agriculture for Titles of Publications.

Grateful acknowledgment is made of the helpful cooperation received from the following members of the staff of the Southern Regional Research Laboratory: Charles F. Goldthwait, Dr. Helmut R. R. Wakeham, Dr. Ruby K. Worner, and Dr. Carl M. Conrad.

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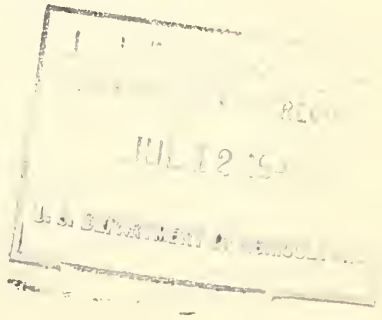

INTRODUCTION

The relationships between cellulose and water are undoubtedly of greater theoretical and practical importance than those between cellulose and any other chemical substances. In the studies of these relationships cotton is a center of interest because it is the largest natural source of nearly pure cellulose as well as the most widely used textile fiber.

The swelling of cotton fibers by absorption of water contributes to such effects as variation in the strength of yarn with humidity and the shrinkage of cloth when not suitably finished. This swelling property, not always an advantage, has recently been utilized as an aid in closing the minute interstices in cotton fabrics that must be resistant to the passage of water. The improvement of the water resistance of cotton goods by means of swelling, is so new that the required properties of fibers have not yet been well correlated with the properties needed in the fabrics.

The present bibliography is intended to help bridge this gap by the collection of selected references on the swelling of cotton and other fibers, supplemented by references to methods applicable in estimating or measuring this swelling. There are also included references on such subjects as the amounts of moisture absorbed from atmospheres of different relative humidities; the swelling produced; the mechanism of the absorption of water by cellulose; the application of fiber swelling in fabrics; and some of the more important methods of measuring water repellency. The bibliography is thus intended to present references to the more important material pertinent to the utilization of the property of swelling in the development of self-sealing water resistant cotton fabrics.

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SOURCES CONSULTED

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National Research Council, Ottawa. Bibliography on wool. Ottawa, 1927.

O'Brien, R., Peterson, E. C., Worner, R. K. Bibliography on the Relation of Clothing to Health. U. S. Dept. Agr. Misc. Pub. 62. November 1929.

Stamm, A. J. Colloid Chemistry of Cellulosic Materials. U. S. Dept. Agr. Misc. Pub. 240. June 1926.

Textile Institute Journal, 1920-July 1946.

Textile Research, 1928-July 1946.

Textile Technology Digest, June 1944-July 1946.

U. S. National Bureau of Standards. Textile Section. References to Literature on Adsorption and Desorption of Moisture by Textile Materials. (RSC:MLP, VII-2) Washington, D. C., 1936.

Card files of references:
Charles F. Goldthwait
Mary L. Rollins
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Helmut R. R. Wakeham
Ruby K. Worner

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1. KATZ, J. R. Die gesetze der quellung. Eine biochemische und kolloidchemische studie. I. Teil: Die quellung in wasser ohne komplikationen. Kolloid Chem. Beihefte 9: 1-182. 1917. 384 Z315K

"In studying the phenomena associated with the swelling of substances in contact with water the conditions necessary in order to avoid all possible disturbing factors are satisfied only by definite chem. compds. which are non-porous, do not combine with the absorbed liquid, and are characterized by the absence of irreversible changes. Both amorphous and cryst. substances fulfill these conditions and have been examd. The vapor pressure, the heat of swelling, the change in vol. and the sp. heat are all dependent on the degree of swelling, defined as the ratio between the wt. of the absorbed water and that of the dry substance under examn. The results for different substances show that the chem. nature of the substance is without influence on the general character of the phenomena associated with the swelling process. For all the amorphous substances examd. the curve showing the relation between the vapor pressure (expressed in terms of that of pure water at the same temp.) and the degree of swelling (i) is of the same type. For small values of i the curve runs horizontal; then rises, at first convex and later concave toward the i axis, and the last portion is again nearly horizontal. The heat developed in the absorption of 1 g. of water by 1 g. of the dry substance is represented by the formula W=Ai/(B-i), in which A and B are consts. characteristic of the swelling substance. The corresponding contraction in vol. may be expressed by a formula of the same type. These two quantities are approx. proportional and the ratio for different substances is of the same order of magnitude. The decrease in the free energy and the heat development associated with the swelling process are approx. equal, hence nearly the whole of the energy of swelling may be transformed into external work. In the case of cryst. substances the relative vapor pressure is dependent on the degree of swelling in essentially the same way as for amorphous substances. The most various substances behave similarly in regard to the swelling processes, and show a close resemblance, in the relative vapor pressure, the heat of swelling and the volume curves, to mixts. of non-volatile liquids, such as H_2SO_4, H_3PO_4 and glycerol with water. The ratio of the heat development to the vol. contraction is of the same order for both groups. This close similarity in the phenomena associated with the swelling of substances in water and in the changes which accompany the formation of binary liquid mixts. leads to the conclusion that the swelling process is to be regarded as the formation of a solid soln. of water in the swelling substance. This idea is obviously incompatible with the micellary hypothesis put forward by Nägeli to explain the behavior of swelling substances. It disposes of the necessity for the assumption of complex structural units and replaces these by the simpler mols. The systems which result from the swelling of substances when brought into contact with suitable liquids are accordingly to be looked on as ideal concd. solns."—Chem. Abs. 11: 3141.

2. COLLINS, G. E. Some physical properties of cotton cellulose and its modifications. A summary of existing data. Textile Inst. J. 13: 204-213. Oct. 1922. 73.9 T31

"The literature is assembled for the following properties: sp. gr., elasticity, sp. inductive capacity, electrification, mech. absorption of liquids, thermal effects accompanying adsorption, action of heat and cold, thermal cond., sp. heat, heat of combustion and of reaction, refractive index, double refraction, action of ultraviolet light, optical activity of sols, ultramicroscopy, evidence of X-rays on structure. 87 references are quoted."—Chem. Abs. 17: 340.

4. COLLINS, G. E. The swelling of cotton cellulose. A summary of the literature. Textile Inst. J. 14: T264-T276. Aug. 1923. 73.9 T31

5. FARCHER, R. G., and WILLIAMS, A. M. The relationship of cotton to water and steam. A summary of the literature. Textile Inst. J. 14: T77-T82. Mar. 1923. 73.9 T31

"By boiling cotton with H_2O under 2 atm. pressure an ext. which amts. to 1.5-2.0% of the total wt. of the cotton is obtained. It is hygroscopic, faintly acid, and reduces Fehling soln. It contains most of the mineral matter in the cotton. The org. constituents in the ext. have not been identified. At 20 atm. pressure and 150° cotton contg. oxycellulose is completely broken down, yielding $C_{12}H_{22}O_{11}$, while pure cotton cellulose is only slightly attacked under similar conditions. Bleaching likewise renders cotton more liable to attack. By heating cotton at temps. above 130°, H_2O is given off owing to decompn. of the cellulose. Heating cotton with steam at 150° and 10 atm. pressure caused no appreciable loss in strength. In the detn. of the Cu number differentiation is made between the amt. of Cu removed from soln. as Cu_2O, and the Cu salts adsorbed by the cellulose. The latter amt. may be considered as a measure of the adsorptive capacity of the material."—Chem. Abs. 17: 2054.

6. URQUHART, A. R. The mechanical testing of cotton materials. B. The effect of humidity and temperature, regarded as conditions of testing, on the strength of cotton yarns and fabrics. A summary of the literature. Textile Inst. J. 14: T183-T188. July 1923. 73.9 T31

"From a consideration of the results which have been discussed above, it is possible to obtain only a general idea of the effect of humidity and temperature on strength. In all cases, the data are the means of insufficient observations. The strength of a yarn or fabric usually varies to such an extent from one portion of the material to another, that any systematic investigation into the effect of humidity on strength must be conducted statistically, and have for its basis the results of a very large number of observations. Turner has treated the problem in this manner, but only with reference to two relative humidities and to sets of fifty observations..."—Author's summary.

7. SHORTER, S. A. The physical properties of textile fibres in relation to technical processes and to general colloid theory. Faraday Soc. Trans. 20: 228-235. 1924. 382 F22

Topics: technically important properties of fibers, absorption of water by textile fibers, elastic properties of fibers, finishing of wool and worsted fabrics, and a theory of the colloidal structure of fibers.

8. URQUHART, A. R., and WILLIAMS, A. M. A review of work on the absorption and desorption of moisture by textile materials. Faraday Soc. Trans. 20: 309-313. 1924. 382 F22

"1. The moisture relations of the textile materials form one subject only, for the materials are so unlike in properties that the differences between them are for the most part quantitative rather than qualitative. On examination of these quantitative differences, however, it is found that they may be of considerable magnitude, and exist not only between different materials, but also between different kinds of the same material.

2. Textile materials resemble other gels in their moisture relations and exhibit a hysteresis, so that there may be a number of possible values of the moisture content for a given humidity, depending on the previous history of the material examined. It is probable that the hysteresis can be explained in terms of the capillary theory of gel structure.

3. The moisture content at constant relative humidity decreases with the increasing temperature, but the decrease is less marked the nearer humidity is to saturation.

4. Study of the rate of absorption and desorption indicates that these processes are discontinuous, the discontinuities probably arising from the intimate structure of the materials examined."—Summary, p. 312-313.

9. MULLIN, C. E. Condition or regain in wool. Textile Colorist 47: 366-369, 497-502. 1925. 306.8 T31

Based mainly on the literature cited in the Bibliography of Papers upon Regain in Textile Materials, listed on p. 500-502.

10. FREUNDLICH, H. Colloid & capillary chemistry. 883 p. London, Methuen & Co., 1926. 386 F895C

Includes discussion on theory and thermodynamics of swelling.

11. STACEY, A. E., jr. Present status of textile regain data. Amer. Wool and Cotton Rptr. 41(44): 113-115 (4507-4509). Nov. 3, 1927. 304.8 W88

"Regain of materials used in the manufacture of textiles and its relationship to the physical characteristics of the materials is assuming a special interest in this day of new ventures in the mixtures of textile materials. An immense amount of excellent research has been done in the investigation of the regain properties of cotton, wool, silk and other natural fibres. Graphs showing results of work by Hartshorne, Wilson & Fuwa, and Schloesing and Wilkomm, are given. As a result of their work the following conclusions are drawn - The regain curves of textiles are essentially within practical limits. The advent of rayon, as a mixture of natural fibres, has introduced new problems in the manufacturing of textile

11. STACEY, A. E., JR. (Cont.)
materials from a humidifying standpoint. The increased speeds of production have indicated the necessity of new investigation of standard conditions of relative humidity to be maintained in the several departments of the mill." —Textile Inst. J. 19: A37

12. BALLS, W. L. Studies of quality in cotton. 376 p. London, Macmillan and Co., Ltd., 1928. 72 B21S

Chapter III is a general discussion of cotton-moisture relationships.

13. BARKER, S. G. The hygroscopic nature of textile fabrics. Inst. Chem. Engin. [London] Trans. 6: 162-167. 1928. 382 In72

"The subject is reviewed and discussed. Tables are given showing the regain for various fibers under different conditions of temp. and relative humidity. List of references."—Chem. Abs. 24: 1221.

14. HESS, K. Die chemie der zellulose und ihrer begleiter; mit einem beitrag: Micellartheorie und quellung der zellulose, von J. R. Katz, und einem anhang: Das färberische verhalten der baumwolle und der aus ihr hergestellten kunstfasern, von R. Haller. 836 p. Leipzig, Akademische Verlagsgesellschaft, m.b.h., 1928. 387.1 H462

16. PEIRCE, F. T. Report on the effect of humidity on cotton yarns from the British Cotton Industry Research Association. In Gt. Brit. Home department. Committee on artificial humidity in cotton cloth factories. Report. London, H. M. Stationery Off., 1928. App. III, p. 55-82. 304 G792

Part I.- Five questions are raised and answers given summarizing the effects of moisture (mainly atmospheric humidity) on the properties of sized and unsized cotton yarns, with some notes on the effects on fibers. 1. What effect has humidity and temperature on American and Egyptian cotton? 2. Is the strength and extensibility of cotton yarn affected by variations in the humidity of the atmosphere surrounding them? 3. Does the sizing of cotton yarns interfere with the action of the surrounding air on the cotton? 4. Is there any sizing ingredient or combination of sizing ingredients and methods of sizing which will keep sized yarns as strong and pliable in a dry atmosphere as in a humid one? 5. Is there any difference in the action of still and moving air at a given temperature and humidity on sized cotton yarns?

Part II.- Experiments and data.

17. HERZOG, R. O. Trends of research. The behaviour of regenerated cellulose to water. Rayon Rec. 4: 313-317. Mar. 21, 1930. 304.8 Si32

"A review of the state of knowledge of the behaviour of regenerated cellulose to water. In the process of absorption water first enters through the intermicellary ducts and then penetrates the micelles themselves; the cohesion of the micelles is thereby reduced, and the tensile strength of the fibre is lessened. Some hitherto unpublished work is briefly mentioned, including investigations of the absorption of water, alcohol, and benzene, and of salts from alcoholic solutions."—Textile Inst. J. 21: A393.

18. KATZ, J. R. Das problem der quellung der cellulose und ihrer derivate. Cellulosechemie 11(2): 17-30. Feb. 9, 1930. 309.8 C33

"A report of a lecture dealing with the thermodynamics of swelling, the quantitative relations governing swelling in water and in organic liquids and their relation to the laws of concentrated aqueous solutions, changes in cohesion produced by swelling, the possibilities of differentiating between intermicellar and intramicellar swelling by means of X-rays, the dependence of swelling on the micellar structure, swelling in mixtures of solvents, and the influence of ions on swelling in aqueous solutions of electrolytes."-Textile Inst. J. 21: A277

Accompanied by bibliographical references, graphs and x-ray photographs.

19. KRUYT, H. R., and MODDERMAN, J. G. Heats of adsorption and their bearing on the problem of adsorption. Chem. Rev. 7: 259-346. 1930. 381 C425

"A thorough review of the exptl. data on heats of adsorption is given. An equation is deduced for calcn. of the isothermal heats of adsorption. Calcd. and observed results agree fairly well. Each of the equations now in use in connection with adsorption has a domain of usefulness but none of them expresses a complete isotherm at lower temps. Eight factors that influence adsorption are listed. Many heats of adsorption are tabulated."—Dietz, V. R. Bibliography of solid adsorbents, 1944, p. 356.

20. *MARK, H. Physik und chemie der cellulose. 330 p. Berlin, J. Springer, 1932. (Technologie der Textilfasern Bd. I, t. 1) 387.1 M34

Includes short, general description of the swelling of cellulose and its derivatives, with a discussion of X-ray and thermodynamic data.

21. ASTBURY, W. T. Fundamentals of fibre structure. 187 p. London, Oxford Univ. Press, 1933. 304 As8

Valuable from standpoint of organized structure of fibers. Fundamentals on structure of cotton fibers as compared to others.

22. KATZ, J. R. The laws of swelling. Faraday Soc. Trans. 29: 279-300. Jan. 1933. 382 F22

"A review is given, together with a brief report of unpublished data on the swelling of polysaccharides and albuminoids in the presence of concd. solns. of thiourea, chloral hydrate, resorcinol and benzenesulfonates."—Chem. Abs. 27: 2081.

Sections on: Definition of swelling; The maximum of swelling; Difficulties in eliminating the last amounts of liquid from a swollen substance; Intermicellar and intramicellar swelling; Permutoid form of swelling; Is there some connecting material which unites the micellae of a swelling substance?; Vapour pressure (free energy) and heat of swelling; Thermodynamics of swelling; Heat of inbibition and volume contraction; The change in the mechanical properties of the solid through swelling; The analogy between swelling and solution as a heuristic principle; Swelling in aqueous solutions of electrolytes; Lyotropic series.

23. MOISTURE absorption by textile materials. (Questions and answers. Inquiry No. 431) Melliand Textile Monthly 5(5-6): 180. Aug.-Sept. 1933. 304.8 M48

"The question of the rate at which textile fibers absorb moisture has not yet been fully cleared up. The relationship between the absorption of moisture and parting with it can be deduced from the colloid character of the fibers. Absorption proceeds very quickly according to the water vapor pressure, because fiber colloids tend to take up particles of water very avidly. On the other hand they give up water quite evidently more slowly, for even at a low vapor pressure in the room as compared with the tension of the water retained by the fiber the latter has the tendency (owing to its colloidal nature) to retain the particles of the water as firmly as possible. Besides the specific power of absorption of the fiber, the ratio of the water vapor pressure in the room to the water vapor pressure in the water contained in the fibers is always decisive for the taking up and parting with moisture. The percentages of the greatest absorption of water are as follows:

Cotton (according to previous treatment)	12-19%
Flax (according to retting process)	14-24%
Jute	up to 35%
Wool	about 30%
Silk	about 10%
Rayon	about 10%

As a rule, the strength of natural fibers is raised by the presence of moisture, but rayon is an exception and its strength is much reduced. The elasticity also increases with the amount of moisture present. The difficulties met with in carrying out breaking and elasticity tests are caused by changes in strength and elongation due to the moisture content of the fibers and the hygrometer must be carefully watched in order to obtain useful results. If the tests are to be accurate, the material must be allowed to lie for at least 24 hours in a room with uniform atmospheric humidity."

24. HEUSER, E. The nature of cellulose. A historical review. Paper Trade J. 101(21): 39-46; (22): 35-41; (23): 39-42. Nov. 21, 28, Dec. 5, 1935. 302.8 P196

"An historical review is presented of the theories relating to the nature and constitution of cellulose. The current conception of a micellar aggregation of chain molecules is dicussed in greater detail, with inclusion of information yielded by X-ray studies. Reference is made to the micro structure of cellulose, and to its colloid properties."—Textile Inst. J. 27: A87. 59 references.

25. STAMM, A. J. Colloid chemistry of cellulosic materials. U. S. Dept. Agr. Misc. P. 240, 99 p. Washington, D. C., 1936. 1 Ag84M

"The author states that he has not undertaken a review of all researches on the colloidal properties of cellulosic materials and that the appended bibliography (280 citations) is far from complete. He has attempted more to tie together salient findings regarding the more important colloidal properties of the cellulosic materials. . . .

25. STAMM, A. J. (Cont.)

"The colloid chemistry of cellulosic materials is now at the stages of transition from a qualitative to a quantitative science. Further researches directed toward the determination of the quantitative interrelationship of the various colloidal properties will make possible a more intimate understanding of the physical nature of cellulose which, in turn, will undoubtedly strengthen its claim to being the world's most important organic raw material." — Expt. Sta. Rec. 75: 740.

27. DEAN, H. K., and others. Scientific and technical aspects, wetting and detergency. A series of papers show that progress is being made in knowledge of wetting, waterproofing, detergency, etc. Textile Mfr. 63: 160, 163. Apr. 1937. 304.8 T3126

A symposium of papers by H. K. Dean, C. Robinson, E. T. Williams, C. S. Brown, H. B. Oakley, H. Phillips, G. S. Hartley, and J. Powney.

28. GUT, E., and ROGOVIN, Z. O rastvorimosti i nabukhanii tsellulozy i ee derivatov. Soobshchenie II. [The solubility and the swelling of cellulose and its derivatives.] Kolloidnyĭ Zhurnal 3: 327-335. 1937. 385 K83

"A discussion of some data in the literature. Differences in soly. are due to changes in mol. vol., to mutual dipole interaction, and to steric effects."—Chem. Abs. 32: 7652.

29. VALKÓ, E. Die wasseraufnahme der faserstoffe. In his Kolloidchemische grundlagen der textilveredlung, p. 77-125. Berlin, J. Springer, 1937. 304 V23

Includes a section on water sorption of cotton and other fibers.

30. NICKERSON, R. F. Cotton fibers, constitution, structure, and mechanical properties. Indus. and Engin. Chem., Indus. Ed. 32: 1454-1462. Nov. 1940. 381 J825

"Data on the constitution of raw cotton are presented and discussed. Various theories of fiber structure are reviewed. A fiber structure in which the component fibrils are formed from many unit crystalline areas linked by primary-valence glucose chains appears to be most acceptable. The crystalline units probably represent the crystallization of portions of adjacent glucose chains. Such mechanical properties as tensile strength, elasticity, plasticity, swelling and elastic aftereffect are summarized. A structure of the type just mentioned is compatible with the properties. One object of the review has been to assemble for ready reference the available data on cotton fiber constituents and properties. These data are presented in their relation to fiber structure wherever it has been possible."—Author's Abs.

31. ADAM, N. K. The physics and chemistry of surfaces. Ed. 3, 436 p. Oxford, Univ. Press, 1941. 334 Ad1 Ed. 3.

Includes theory of absorption and its relations to total surface area.

32. KHINCHIN, IA. G. [Physical-chemical factors in the manufacture of paper. The swelling of cellulose fibers in water.] Bumazhnaia Promyshlennost 19(1): 8-12. 1941.

"The phenomenon of swelling is discussed on the basis of the literature and the importance of its observation during the processes of paper manuf. is pointed out."—Chem. Abs. 38: 3467.

33. KRAEMER, E. O. Survey of the literature on cellulose and allied substances - 1938-1940. II. Colloidal aspects of cellulose. Tech. Assoc. Pulp and Paper Indus. Tech. Assoc. Papers 25: 711-716. 1942. 302.9 T22

34. MARSH, J. T., and WOOD, F. C. The moisture relations of cellulose. In their An Introduction to the chemistry of cellulose. ed. 2, p. 29-41. London, Chapman & Hall, 1942. 387.1 M35

35. NICKERSON, R. F. Structure, properties, and utilization of cotton. Influences of common agencies on behavior. Indus. and Engin. Chem., Indus. Ed. 34: 1149-1154. 1942. 381 J825

"A review of the cotton-fiber structure and its phys. properties, and behavior under various conditions is presented. The concept of H bonding between cellulose chains and between internal-fiber surfaces is used as a working hypothesis to interpret the properties and phenomena exhibited by cotton and its derivs. The effects of moisture, heat, stresses and time are emphasized. The behavior of the fiber in a few industrial applications is discussed briefly."—Chem. Abs. 36: 7326.

36. OTT, E., ed. Cellulose and cellulose derivatives, a monograph prepared by a staff of specialists. 1176 p. New York, Interscience Publishers, 1943. (High Polymers. v. 5) 386 H53

Chapter III, Structure and Properties of Cellulose Fibers, p. 201-423. Partial contents: X-ray examination, by W. A. Sisson, p. 203-285; Beating and hydration of paper fibers, by J. d' A. Clark, p. 352-378; Sorption of water and other vapors by cellulose, by E. I. Valko, p. 379-423.

The index should be consulted for other references to swelling of fibers.

37. CARLENE, P. W. The moisture relations of textiles. A survey of the literature. Soc. Dyers and Colourists, J. 60: 232-237. Sept. 1944. 306.9 So1

"The results of the more important investigations into the hydroscopicity of textiles are noted. The absorption and desorption of water by fibers, the influence of moisture on the phys. characteristics of textile fibers, and the effect of processing upon the moisture absorbency of textiles are included. 56 references."—Chem. Abs. 38: 6568.

38. HEUSER, E. The chemistry of cellulose. 660 p. New York, J. Wiley & Sons, Inc.; 1944. 387.1 H482C

Reactions of cellulose with water, p. 42-62.

40. LIESEGANG, R. E. Kolloide in der technik. 2., völlig neu bearb. aufl. 123 p. Dresden, T. Steinkopff, 1943. 386 L622K Ed. 2.

Lithoprinted by Edwards Brothers, Inc., Ann Arbor, Mich., 1944.

41. STAMM, A. J. Surface properties of cellulosic materials. In Wise, L. E., ed. Wood chemistry, pt. IV, p. 449-550. New York, Reinhold Pub. Corp., 1944. 99.79 W75

Contains sections on sorption of water vapor, ways in which water is held, shrinking and swelling of cellulose substance, swelling theories, and related topics. 252 references.

42. TEXTILE RESEARCH INSTITUTE, INC. The drying of textiles. Reprint of reports published in textile research. 68 p. New York, 1944. 304 T319D

Contents.- I. Three years of textile drying research, by A. C. Walker; II. Equipment for conditioning materials at constant humidities and elevated temperatures, by J. G. Wiegerink; III. The moisture relations of textile fibers at elevated temperatures, by J. G. Wiegerink; IV. Effects of drying conditions on properties of textile yarns, by J. G. Wiegerink; V. Relationship of time, temperature and humidity in the drying of textiles, by A. C. Walker; VI. Drying of textile materials: literature references, comp. by C. H. Clark.

43. "CHEMITEX" [pseud.] The moisture relations of textile fibers. Silk J. and Rayon World 21(254): 35-37. July 1945. 304.8 Si3

An extensive review, including tables showing moisture regain of textile materials, wet strength of textile fibers, breaking load at various humidities, extension at break (dry and wet), percent extension at break at different humidities, dimensional changes with humidity, change in area of cross-section from 65% relative humidity to wet, and imbibition of water. Original references are not given.

44. KENCHINGTON, K. W. L. Moisture relationships of textile fibres. Fibres 7(2): 36-39. Feb. 1946.

Some fundamentals of the subject are explained under headings: humidity, hygroscopic moisture, regain, and hysteresis.

45. MARSHALL, H. B., and JOHNSON, A. M. A review of the cellulose-water relationship and pulp beating theories. Pulp and Paper Mag. Canada 47(4): 65-66, 83-84. Mar. 1946. 302.8 P96

Also in Paper Maker and Brit. Paper Trade J. 111(6): TS57-TS59. June 1946. 302.8 P1922

Review of the various theories and hypotheses to explain the effectiveness of the beating of pulp for paper making. No references are given to the literature.

46. JUSTIN-MUELLER, E. The swelling of textile fibres on immersion in water. (Abs.) Soc. Dyers and Colourists J. 30: 354-355. Dec. 1914. 306.9 So1

Description of apparatus, the "turgometer" to measure turgescence. Original article from Assoc. Gen. des Chim. de l'Ind. Text. May 1914.

46a. AMERICAN CHEMICAL SOCIETY. DIVISION OF CELLULOSE CHEMISTRY. The preparation of standard cotton cellulose and the proposed methods of analysis. Indus. and Engin. Chem., Indus. Ed. 15: 748-751. July 1923. 381 J825

Report of a committee composed of W. F. Henderson, Bjarne Johnson, W. O. Mitscherling, L. E. Wise, and Harold Hilbert, chairman.

"...Describes in detail the procedure proposed for the prepn. of a standard cotton cellulose for research purposes and the methods proposed for its analysis."—Chem. Abs. 17: 2781.

47. COWARD, H. F., and SPENCER, L. The efficacy of a centrifuge for removing surface liquids from cotton hairs. Textile Inst. J. 14: T28-T32. Jan. 1923. 73.9 T31

"The centrifuge designed to the authors' specification had an effective diam. of 8.2 cm. and was motor-driven at rates up to 8000 r.p.m. At the max. rate its centrifugal acceleration was 2000 times that of gravity. Trials were made at various speeds maintained for various times with cotton wet, resp., with water, 20.1% NaOH, 48.8% NaOh, alc., xylene and other liquids. A few min. centrifuging at max. speed removes the interfibrillar liquid down to 5 to 10% of the wt. of the fibers themselves, except in the case of extremely viscous liquids such as castor oil. Since cotton retains water after centrifuging up to 50% of its wt., and NaOH solns. up to nearly 300% of its wt., practically all of these liquids are held within the body of the cotton hairs."—Chem. Abs. 17: 1553.

48. OBERMILLER, J., and GOERTZ, M. Neue absorptions- und trockentürmchen für quantitative bestimmungen und ein für sie geeigneter erhitzungsofen, sowie ihre verwendung für die exakte trockrung von textilfasern. Ztschr. F. Angew. Chem. 36: 429-432. Aug. 15, 1923. 384 Z33

"The tower" consists of a small glass cylindrical vessel of from 30-250 cc. capacity, with outlet and inlet tubes on opposite sides near the top. A 2nd vessel of slightly smaller diam., with a hand-grip and neck for thermometer on top, slips into the vessel and fits with a ground joint at the top. At the inlet arm on the outer vessel, the inner vessel bulges slightly inward freely to admit air or gas which passed down between the vessels to the bottom, then up through the inner vessel which contains the drying material, or material to be dried (wool, cotton, silk, etc.), then out through a small hole which registers with the exit arm on the outer vessel."—Chem. Abs. 17: 3432.

49. COREY, A. B., and GRAY, H. LeB. Notes on the preparation of standard cellulose. Indus. and Engin. Chem., Indus. Ed. 16: 853-854, 1130. 1924. 381 J825

"A constructive criticism of the methods published by the committee of the Division of Cellulose Chem. of the Am. Chem. Soc. (cf. C. A. 17, 2781). C. and G. recommend that the size of the Ni container and the vol. of washing soln. be increased and that the bleach and rosin soap be omitted. A tentative method for the prepn. of standard cellulose is offered for consideration and criticism, and analyses of cotton purified by the old and modern methods are given."—Chem. Abs. 18: 2805.

50. OBERMILLER, J., and GOERTZ, M. Die exakte trocknung der textilfasern für wissenschaftliche und technische zwecke. Ztschr. F. Angew. Chem. 37: 940-945. Nov. 27, 1924. 384 Z33

"In detg. moisture at temps. of 105-110° for cotton or wool, and of 140° for silk and rayons, in ordinary moist air, unsatisfactory results are obtained. Fibers have a hygroscopic power comparable to that of P_2O and so cannot be dried even at 110 in moist air; a certain equil. with air is established depending on the temp. and humidity of the air. Using the previously described apparatus, exhaustive tests were made upon all kinds of fibers. When treated in a stream of dry air, P_2O_5 complete drying of the sample can be attained at even low temperatures; the only influence of the temperature is upon the speed of the process. Other series of tests in air brought to (a) 75% humidity by passing it over moist NaCl, (b) 55% by moist $Ca(NO_3)_2$, (c) 35% by moist crystallized $CaCl_2$ and (d) 2.5 by dehydrated $CaCl_2$ showed that even at temps. of 105-110° satisfactory drying was not attained. Heating for 3-5 hours at 85-90° in a current of dried air gave a complete drying for all fibers, without damage to them or to the rubber tubing used for connections with an accuracy of 0.01% on a 10-gr. sample. This occurs, too, in spite of minute changes due to side reactions (e.g., oxidation, fat alteration, etc.)."—Chem. Abs. 19: 897.

51. WADSWORTH, F. D. Determination of moisture in various fibers. Textile Colorist 46: 85-88, 235-238, 303-306, 365, 368-370. 1924. 306.8 T31

"A description of the methods of detn. as well as the app. and calcns. used."—Chem. Abs. 18: 3115.

52. WEBER, O. H. Ein beitrag zur bestimmung des feuchtigkeitsgehaltes von pflanzlichen faserstoffen und zellulose. Wochbl. f. Papierfabrikation 56: 357-358. 1925. 302.8 W81

"The fibers are contained in a 300 cc. flask to which is fitted a 3-hole rubber stopper contg. a thermometer, a tube leading to a nitrometer, and a tube with an attached rubber tube through which passes a wire to hold suspended in the flask a small beaker containing 2 g. CaC_2 (fineness of sand). The beaker is tipped by the wire and the CaC_2 mixed with the fibers, the moisture of which generates a proportionate volume of C_2H_2 which is indirectly measured in the nitrometer. The reaction is complete in about ten min. 1-2% accuracy is claimed."—Chem. Abs. 19: 2128.

53. MCBAIN, J. W., and BAKR, A. M. A new sorption balance. Amer. Chem. Soc. J. 48: 690-695. Mar. 1926. 381 Am33J

"A flat, helical spring of silica is made by heating a SiO_2 rod and drawing it out quickly, then wrapping the resulting fiber about a C rod of suitable diam., heating the fiber at the point where it is being bent. The elongation of the spring under varying known wts. and at several temps. over the range in which it is to be used is detd. Elongations are read by means of a traveling microscope. The spring, from the end of which is suspended a bucket contg. the adsorbent, is supported within a glass tube contg. a thin-walled glass bulb holding the liquid whose vapor is to be adsorbed. After evacuating the system and sealing off the tube, the glass bulb is broken by a magnetic device. The downward movement of the spring measures the amt. of vapor adsorbed. Investigations of sorption above and below the crit. points can be made readily."—Chem. Abs. 20: 1151.

54. PRITZKER, J., and JUNGKUNZ, R. Neuer distillationsaufsatz für die wasserbestimmung durch destillation mit Xylol. Chem. Ztg. 50: 962-963. Dec. 22, 1926. 384 C427

"The app. consists of 3 parts: a narrow glass tube leading to a larger chamber, a condenser which rests on the top of the large chamber, and a measuring tube which is attached to the bottom of this chamber. The distillate passes up through the narrow tube, is completely condensed in the larger chamber and drops down into the measuring tube. The sample is covered with 75 cc. of xylene and the disn. started. After 15-30 mins., the app. is allowed to cool and the contents of the measuring tube are centrifuged to get a well-defined line of demarcation between the water and xylene. An empirical correction of 0.1 cc. is added to the reading."—Chem. Abs. 21: 719.

55. STEVENSON, L., and LINDSAY, M. Methods of testing the absorption of water by cotton toweling. J. Home Econ. 18: 193-198. Apr. 1926. 321.8 J82

Describes the following methods for determining the absorption of water by toweling: wet bulb thermometer, powdered eosin, immersion, and wet surface.

56. JUSTIN-MUELLER, [E.] La turgométrie dans l'industrie textile. Tiba 5: 1215-1217, 1219, 1221. Oct. 1927. 306.8 T43

"'Turgometry' is defined as the art of measuring the 'turgescence' of 'turgoidal' bodies, i.e., of measuring the swelling under definite conditions of organized substances, such as textile fibers, hide, leather, etc., which swell without dissolving. An app. ('turgometer') is described for carrying out the measurements; and its application is discussed by means of examples."—Chem. Abs. 22: 321.

57. STAMM, A. J. The electrical resistance of wood as a measure of its moisture content. Indus. and Engin. Chem., Indus. Ed. 19: 1021-1025. 1927. 381 J825

"This investigation indicates broadly the effects of moisture and certain exptl. and natural factors on the elec. resistance of wood. Directions can be made for

57. STAMM, A. J. (Cont.)
such factors as contact resistance, species and density of wood, direction of current, temp., ash and extent of specimen beyond electrodes. As a means of measuring the av. moisture content of wood, this method is practical only within narrow limits."—Chem. Abs. 22: 858.

58. BURR, A. H. A simple constant-drop apparatus. Soc. Dyers and Colourists. J. 44: 18-19. Jan. 1928. 306.9 So1
For testing the resistance of waterproofed cloth.

59. NEWSOME, P. T. McBain-Bakr balance for sorption of vapors by fibrous and film materials. Indus. and Engin. Chem., Indus. Ed. 20: 827. Aug. 1928. 381 J825
"An illustrated description of a modification of the quartz fiber spring balance previously described (cf. C. A. 20, 1151). The sorption of vapors by fibrous and film materials may be measured by suspending the sample from the spring, evacuating and introducing by stopcock controls a small quantity of liquid. The pressure and elongation of the spring are measured with a cathetometer. The complete app. includes a device for admitting the vapors from a liquid which attacks stopcock grease. This device also makes possible a study of the successive absorption of 2 different liquids."—Chem. Abs. 22: 3070.

60. SCHAEFER, K. Beitrag zur wasserbestimmung durch destillation mit xylol und tetrachloräthan. Chem. Ztg. 52: 408. May 23, 1928. 384 C427
"A new construction of the app. recommended by S. in 1924 is shown. The disg. flask which serves to hold the excess reagent is provided with a ground-glass stopper connecting with a condenser at the top of which is a siphon tube which carries the excess reagent back to the flask through another tube leading through the ground-glass stopper. In the condenser is a measuring tube which is filled with xylene or tetrachloroethane at the start. During the expt. the water collects in this tube, replacing the reagent. When tetrachloroethane is used, which has the advantage of not being combustible, a slight change in the construction of the app. is necessary."—Chem. Abs. 22: 3110.

61. FREUNDLICH, H., and SACHS, W. Die flüssigkeitsaufnahme disperser massen und ihre beziehung zu hydrophilie, quellung und sedimentation. Ztschr. f. Phys. Chem. Abt. A: Chem. Thermodynamik. 145(3/4): 177-199. 1929. 384 Z37
"An app. for detg. the ability of various absorbents to take up liquids is described. A known amt. of powdered absorbent is packed into a definite vol. and covered by a porous membrane. A known quantity of liquid is added (the system is either closed in the beginning or is closed immediately after the liquid is added). The reduction in vol. due to absorption of liquid is reflected by reduction of pressure, which is followed by means of a manometer. Absorption is very rapid at first but decreases in rate with time until equil. is reached, which usually requires about 20-60 min. Hydrophobic substances like As_2S_3 and V_2O_5 absorb almost no H_2O. Powd. quartz and glass take up an appreciable quantity of H_2O in a very short time (1 min. or less). Other substances such as kaolin, fuller's earth and bentonite, which exhibit a relatively large swelling, absorb considerable H_2O, but they require more time (sometimes several hrs.) to attain equil. The rate of absorption is independent of the thickness of kaolin layers of the same bulk d. during the early stages. Pore vol. cannot be the sole detg. factor because of the difference in the vols of different liquids (H_2O, cumene, cyclohexanone) that are absorbed by unit wt. of absorbent of const. bulk d. In some cases the curve of absorption vs. time could be expressed by the unimol. reaction law. In general, the smaller the rate of liquid absorption, the greater the swelling of the absorbent. Expts. with kaolin show that addn. of electrolytes to H_2O increases the rate of liquid absorption up to a certain limit. At higher concns. of electrolyte the rate of absorption may be lower than in distd. H_2O; this may be due to the great increase in viscosity. The amt. of liquid absorbed at equil. increased with electrolyte concn. to a definite limit. The effect of electrolytes upon kaolin suspensions was detd. by measuring the distance between the level of the liquid and that of the sediment at apparent equil. The vol. of sediment increased with electrolyte concn. up to a limiting value. This parallelism between vol. of liquid absorbed and vol. of sediment under influence of electrolytes is interpreted to mean that the kaolin can hold a certain definite quantity of liquid which becomes a max. when the amt. of electrolyte upon a kaolin particle reaches a certain limit. If at a given concn. the electrolytes are arranged in order of sedimentation vol., a series similar to that of Hofmeister is obtained: e.g., KCN, KI, KCNS, KNO_3, KBr, KCl, K_2SO_4, $(NH_4)_2SO_4$, Li_2SO_4. KCN always occupies the extreme position, i.e., causes the highest rate of sedimentation and gives the greatest vol. of sediment at equil. This cannot be attributed to hydroxyl ion."—Chem. Abs. 24: 1781.

62. FRIEDRICHS, F. Ein neuer apparat zur wasserbestimmung mittels schwer entzündlicher wärmeübertrager. Chem. Ztg. 53(29): 287. Apr. 10, 1929. 384 C427
"The substance is distd. with $C_2H_2Cl_4$ the distillate passing through a bulb on the lower end of a buret into which the H_2O rises and is measured."—Chem. Abs. 23: 3128.

63. HAMM, H. A., and JESSUP, D. A. A comparison of methods for determination of moisture in textiles. Amer. Dyestuff Rptr. 18: 637-639. Sept. 30, 1929. 306.8 Am3
"The moisture contents of cotton, jute, manila and wool were detd. by drying in an air oven and in two types of conditioning ovens, by distg. with toluene and by drying over H_2SO_4. The results obtained by drying in the air oven, by drying in the small lab. conditioning oven, and by drying over H_2SO_4 were in good agreement. The toluene distn. method gave higher results. The large conditioning oven gave variable results. All the methods appear to be suitable for routine purposes."—Chem. Abs. 24: 1229.

64. STAMM, A. J. The fiber-saturation point of wood as obtained from electrical conductivity measurements. Indus. and Engin. Chem., Analyt. Ed. 1: 94-97. 1929. 381 J825
"A method for determining the fiber-saturation point of wood by electrical conductivity has been developed so as to minimize the effect of moisture gradients. Small specimens less than a fiber length in thickness were used. The same linear relationship between the logarithms of electrical conductivity and of moisture content exists at the lower moisture-content values, for all of the species studied. The point of tangency of the line showing this relationship with the curve for higher values of moisture content, which represents the fiber-saturation point, differs slightly among the species, and the upper part of the curve does also. ...Fiber-saturation values obtained by other means are given for comparison with those obtained by the electrical conductivity method. od."—Author's Abs.

65. TAYLOR, W. W. A method of determining free and bound water. J. Physiol. 67: xxxix. 1929. 477.8 J82
"The lowering of the opalescence temp. of a phenol-H_2O mixt. (e.g., 10 to 11% phenol) by the addn. of known amts. of a soln. was detd. in a Beckmann f-p.app.; the amt. of H_2O alone which produced the same depressions was also detd. The latter gave the free H_2O and the difference between it and the total H_2O gave the bound H_2O."—Chem. Abs. 24: 136.

66. DAVIDSON, G. F., and SHORTER, S. A. The dry weight of cotton. Textile Inst. J. 21: T165-T178. Apr. 1930. 73.9 T31
"Although it is generally recognized that the detn. of the moisture content of a textile material is not an absolutely definite process and that different drying conditions give different values, there is little definite information regarding the relation of apparent dry wts. to each other or to the true dry wt. The 'true dry wt.' is defined as the const. wt. obtained by prolonged exposure at room temp. to an atm. dried by P_2O_5. The time required to reach apparent constancy of wt. depends upon the accuracy required; under conditions of commercial testing, the rate of loss is slow after a few hrs. The apparent dry wt. depends upon the humidity. In dry air, it is independent of temp. over a large range, but above 100° a smaller dry wt. is obtained, as a result of permanent loss of H_2O or other material. The permanent loss in wt. at high temps. is much greater with unbleached than with bleached cotton, suggesting that the loss is associated chiefly with non-cellulosic constituents of cotton. The apparent dry wt. is equal to the true dry wt. plus the residual regain minus the permanent loss. The residual regain and the permanent loss can be detd. separately by observations conducted at different temps. and humidities."—Chem. Abs. 24: 6026.

67. JUSTIN-MUELLER, E. Note sur la turgométrie. Tiba 8: 789. July 1930. 306.8 T43

"A brief description of the precautions to be observed in using the turgometer (instrument for measuring the swelling of textile fibers) with materials having a low degree of turgescense, such as cotton, showing that when properly used the instrument gives results in agreement with those obtained in practice in the dyeing of cotton."—Chem. Abs. 24: 4936.

68. KOSHAL, R. S., and TURNER, A. J. Studies in the sampling of cotton for the determination of fibre-properties. I. Introductory and experimental. II. Frequency-curves for various fibre-properties. Textile Inst. J. 21: T325-T370. Aug. 1930. 73.9 T31

"Sampling method for diameter measurement."—Chem. Abs. 24: 6025.

69. FOURNIER, R. La viscose; mesure du gonflement des fibres. Papeterie 53: 1193-1197. Oct. 10, 1931. 302.8 P1932

"The following method is recommended: Det. H_2O by drying to const. wt. at 100-5°. Introduce 10 g. or more of pulp (preferably previously dried) torn into small pieces into a carefully calibrated flask, add water (e.g., from a buret) to the calibration mark; the difference between the water added and the capacity of the flask gives the vol. of the pulp. Introduce a second similar sample into a tared calibrated flask, add sufficient 17.5% NaOH completely to cover the pulp, after a definite time remove the excess soln. by inverting the flask previously covered with a perforated porcelain plate, let drain for a definite time, weigh, and det. the vol. of the soda-soaked pulp by filling to the mark with a liquid which is immiscible with NaOH soln. and which has no appreciable action on the pulp. The swelling power under the conditions selected is easily calcd."—Chem. Abs. 26: 592.

70. POPE, O. A. The determination of sample size for diameter measurements in cotton fiber studies. J. Agr. Res. 43: 957-984. 1931. 1 Ag84J

"The determination of the smallest number of individual cotton fiber diameter measurements that would constitute a statistically reliable sample was sought for at the Arkansas Experiment Station. An intimate relationship exists between fiber diameter dimensions and the spinning and manufacturing value of cotton. The measurement of mean diameter $\frac{W+T}{2}$ suggested by Barritt (E.S.R., 61, p. 897) seemed the most practical of methods for measuring fineness from the viewpoint of giving a measure of the normal collapsed fiber. The diameter dimension ratio $\frac{W}{T}$ is proposed as a measure of the relative fiber wall thickness among different varieties and strains. In these formulas the width (W) is taken at the widest part of the convolution as it appears in flat view under the microscope, and the thickness (T) is the measurement of the edge-on position of the fiber. Consideration of all of the distributions of the fiber dimensional constants suggested that diameter measurements may safely be regarded as normal distributions in so far as statistical treatment is concerned. The frequency distributions for the diameter dimension showed a greater range in Rowden 3003 than in either New Boykin 1235 or Lightning Express No. 7. This may be due to a lack of physiological balance caused by selection for staple length while retaining the genetic diameter of a coarse, short-staple cotton. Significant errors evidently were not introduced by the rounding off used in the conversion table or by the size of class selected in constructing the frequency distributions, and the technic used in measuring was such that a fairly good random distribution of values was obtained. A formula presented determines the size of sample for which differences will be statistically significant within a given range of accuracy. A sample size of 100 measurements of width and thickness, according to evidence obtained in this experiment, will provide a safe margin of statistical significance for the determination of differences on the basis of a $\pm 0.5\mu$ range, as well as a range of 2.5 per cent of the mean. The measurements showed Rowden 3003 and New Boykin 1235 to be similar in fineness, although differing considerably in staple length. Differences of considerable magnitude were found between these strains and Lightning Express No. 7."—Expt. Sta. Rec. 66, 797.

71. BALLS, W. L. Rapid estimation of water-content in undisturbed soil and in bales of cotton. Nature [London] 129: 505-506. 1932. 472 N21

"Variation in the capacity of a condenser (Hg in wet glass tubing) forms the basis of the method, which can also be applied to detg. the concns. of mixts. of liquids with different dielec. consts."—Chem. Abs. 26: 5276.

72. *IMO'O, K. [Apparatus for determining the water content of organic substances.] Japanese Pat. 95,386, Apr. 8, 1932.

"The water content of org. substances (such as cellulose...) is proportional to the humidity of spaces between the particles. An app. designed to det. this humidity consists of a hollow-perforated tube contg. a thermometer and a hygrometer."—Chem. Abs. 27: 2608.

73. OSBORNE, G. G. Micro-analysis of textile fibres. Part I. Techniques: Sectioning, dissecting, swelling, compressing and casting. Textile Res. 4: 84-111. Dec. 1933. 304.8 T293

"1. The preparation of delicate mounts, such as single fibres or filaments, by the slide method has proven to be the most satisfactory. If the specimen is of a soft nature, such as rayon or wool, paraffin alone is recommended. If the specimen is hard and brittle, like cotton or flax, an extra process to coat the mount with celluloid is advised. 2. For bulkier mounts of soft nature a straight paraffin candle can be used. If the fibre is hard and brittle the same procedure is recommended as for single fibres. While, if the fibre lies between these two extremes, a collodion or celluloid core is desirable before building-up with paraffin. 3. A method has been devised for the isolation of single bast fibre cells. Subsequent treatment enables their spiro-fibrillae nature to be studied. 4. The use of a moulding medium to form casts offers a means of differentiating external from internal detail and for studying surface structures."—Author's summary.

74. BANCROFT, W. D., and CALKIN, J. B. The taking up of water by cellulose. Textile Res. 4: 371-398. June 1934. 304.8 T293

"H_2O adsorbed by cotton can be removed partially by centrifuging. A new technic must be devised before one can attribute any phys. significance to the amt. of H_2O or soln. retained after centrifuging. The amt. of moisture adsorbed by cotton from satd. H_2O vapor (at 25°) has been detd. in the correct way by approaching the equil. from both sides. The amt. taken up from satd. H_2O vapor by a sample of cotton was 27%. The part of cellulose peptized by NaOH adsorbs more H_2O than that which is not peptized. Various forms and derivs. of cellulose take up different amts. of H_2O. The adsorption of moisture by cellulose being an exothermic reaction, increasing the temp. decreases the amt. taken up. Under present exptl. conditions there is a hysteresis effect. Adsorbed air and time for readjustment of the cellulose surface might be factors. It is known that capillary condensation cannot account for the H_2O taken up. With the limitations of X-rays there is no proof that some of the H_2O may not be dissolved giving a solid soln. It is not known if the initial H_2O adsorbed is held more strongly than subsequent amts. Stoichiometric hydrates of cellulose do not exist. Eighty-three references."—Chem. Abs. 28: 7025.

75. HESS, K., and READHIMER, D. A comparison of methods for determining the absorption of water by fabrics. J. Home Econ. 26: 298-303. 1934. 321.8 J82

"In this contribution from the Kansas Experiment Station, a comparison is reported of several methods of determining the water absorption of fabrics. These included the eosin dye and wet surface methods as described by L. Stevenson and M. Lindsay (J. Home Econ. 18 (1926), No. 4, pp. 193-198.) and a method described by G. B. Haven (Am. Dyestuff Reptr. 19 (1930), No. 21, pp. 757-761, 782-785, figs. 20.) in which 1-in. strips of the fabric are placed over an illuminated table so that the rate of absorption may be observed. With slight changes in technic, which are described, the Haven method proved to be comparatively accurate and rapid for turkish toweling, if the work was done under controlled atmospheric conditions, but was unsuitable for knit underwear fabrics. For this material the wet surface method, with certain modifications, proved satisfactory. With precautions to prevent the exposure of the moisture-free fabric to the atmosphere, this test can be performed in a laboratory in which constant relative humidity and temperature are not maintained."—Expt. Sta. Rec. 72: 733.

76. KATZ, K. [Swelling of cellulose.] Iskusstvennoe Volokno 5(4): 8-12. 1934.

"The usual phys. methods of testing viscose swelling in H_2O are discussed."—Chem. Abs. 28: 6563.

77. SOBUE, H. Hydration of the fibre. IV. Fluctuation of fibre length by the change of atmospheric humidity. (Abs.) Soc. Chem. Indus. [Japan] J.(Sup. binding) 37: 777B-780B. Dec. 1934. J385 J82

"From investigations on the influence of atmospheric humidity on fibre length, the author concludes that both intermicellar and intramicellar imbibition occurs. The latter is very small in natural cellulose fibres, but is larger in regenerated cellulose fibres and in alkali-treated animal fibres. In the experiments, silk, rayon and wool fibres were mounted in place of the hair in a hygrometer of the circular dial type and kept side by side with a Lambrecht's polymeter. The readings were plotted for periods up to 30 days."—Textile Inst. J. 26: A260.

78. STEINBERGER, R. L. Elastic and plastic properties of textile fibres. Part III. Swelling of cotton and cellulose acetate when exposed to air at various relative humidities. Textile Res. 4: 331-347. May 1934. 304.8 T293

"A method is described whereby the swelling of single fibers in air of varying relative humidities may be watched under the microscope."—Chem. Abs. 28: 7023.

79. BECKER, B. Prüfgerät zur bestimmung der wasseraufnahmefähigkeit von textilien. Ztschr. f. die Gesam. Textil-Indus. 38(18): 235-237; (19): 3-4. 1935.

"A review of several machines and procedures. The results of a no. of detns. are given and pictures of several moisture-absorption testers are shown."—Chem. Abs. 29: 4591.

80. FILBY, E., and MAASS, O. The sorption of water vapor on cellulosic materials. Canad. J. Res. Sect. B, Chem. Sci. 13(1): 1-10. July 1935. 330.9 C16C

"A direct method used for measuring the adsorption of water vapor on cellulosic materials and in which a number of improvements have been made is described. It is ensured that no vapors other than water are present no matter how long a time is required for the establishment of equilibrium. The adsorption and desorption isotherms of standard cellulose, spruce wood, surgical cotton, Kodak rag cellulose and bleached sulphite have been measured, and the data which indicate the time required for the establishment of true equilibrium have been given. The data of Urquhart and Williams ... for standard cellulose determined by an indirect method in 1926 have been shown to be correct."—Author's abstract.

81. FISCHER, K. Neues verfahren zur massanalytischen bestimmung des wassergehaltes von flüssigkeiten und festen körpern. Angew. Chem. 48: 394-396. June 30, 1935. 384 Z33

"The water content is determined by means of liquid sulfur dioxide in methyl alcohol solution according to the equation: $2H_2O+SO_2+I_2=H_2SO_4+2HI$. Addition of pyridine fixes the acids and the amount of iodine solution used can be read directly by titrating with a standard solution (790 grams of pyridine, 192 grams of sulfur dioxide and 254 grams of iodine) dissolved in 5.1 liters of anhydrous solvent. If all the reagents are anhydrous, 1 cc. of this solution corresponds to 7.2 mg. of water. Detailed directions for the preparation of the solution are given. The accuracy of the method is better than that of the calcium carbide method and the method is applicable in many instances where the carbide method fails."—Chem. Abs. 29: 6532.

82. SPENCER-SMITH, J. L. An electrical method for measuring the moisture contents of fabrics. Textile Inst. J. 26: T336-T340. Nov. 1935. 73.9 T31

"In methods of this type, based on the change of dielec. const. of the material, the material is placed in the field of a condenser and the increase of capacitance then is due to the difference of the material in a dry state and when the moisture is included."—Chem. Abs. 30: 2012.

83. STAEDEL, W. Gerät zur prüfung der luftleuchtigkeitsdichte von papieren, geweben, folien, leder und anderen werkstoffen. Wochnbl. f. Papierfabrikation 66: 224-228. 1935. 302.8 W81

"The test sheet or fabric is securely stretched over a shallow pan which usually contains a felt moistened with H_2O, so that the relative humidity in the sealed container is 100%. The outer air, which is blown over the sheet with a velocity of 3m./sec. is held at a relative humidity of 65% at 20°. The loss in wt. in g./sq.dm./hr. is an index of the transmission of water. The cabinet in which such detns. are carried out may also be used for the rapid conditioning of the test sheets or fabrics. Illustrations and full descriptions of the app. are given, and the effects of temp., relative humidity, velocity of air circulation, etc., are discussed. The samples investigated included 24 different kinds of paper, pulp sheets and textiles."—Chem. Abs. 29: 7125.

84. STAMM, A. J., and SEBORG, R. M. Adsorption compression of cellulose and wood. I. Density measurements in benzene. J. Phys. Chem. 39: 133-142. 1935. 381 J822

"The apparent adsorption compressions of water (C) in C_6H_6 for Sitka spruce, white spruce, sulfite pulps (unbeaten and highly beaten) and cotton were detd. The equation used was: $C=\{w_w/d_w\}-\{[W_b-(W-m_1)]/d_b\}(m_o/D)+m_o$, where C=decrease in vol. due to compression in cc./g. dry adsorbent; d_w=normal d. of H_2O; d_b=d. of C_6H_6; D=true d. of adsorbent material; w_w=wt. of sorbed H_2O; m_o=wt. of dry and m_1=wt. of wet adsorbent; W_b wt. of pycnometer filled with C_6H_6 alone, and W=wt. of pycnometer filled with wet adsorbent material and C_6H_6. The effect of small variations in D on the resulting C are shown and it is evident that C is of the order of a few 1000 rather than 10^5 atms. (cf. Filby and Maas, C. A. 26, 5414). Actual adsorption compression values can be obtained by the S. and S. method at higher moisture contents, and the adsorption compression extends to the fiber-satn. point."—Chem. Abs. 29: 2737.

85. DUMANSKIĬ, A. V., and NEIMAN, O. V. [Use of the interferometer for the determination of bound water.] Kolloidnyĭ Zhurnal 2: 615-619. 1936. 385 K83

"The Dumanskii interferometric method (cf. C. A. 28, 1245[6]) is very accurate. With increasing content of glucose in soln. the bound-water contents of 2 samples of cotton wool rapidly decrease. As the glucose content decreased from 4 to 0%, the bound water increased from 5 and 10% in the 2 kinds of cotton wool to 106 and 219%. Bound-water content decreased linearly with rise of temp. from 91 and 26% at 0° to 57 and 16%, resp., at 48°. By extrapolation both curves cross 0% at 128°, where it is assumed that disintergration of the diffusion layers occurs."—Chem. Abs. 31: 2068.

86. ENGELER, A., and others. Die feuchtigkeitsaufnahme organischer faserstoffe. Schweizer Archiv. fur Angewandte Wissenschaft und Technik. 2: 265-273. 1936.

J. Friedle, H. Stager, and H. Tschudi, joint authors.

"Several series of experiments are reported that were designed to establish the conditions for the accurate measurement of moisture absorption by fibres. Factors to be observed are (1) the relative humidity should not be above 90 per cent., (2) constancy of temperature, (3) a constant relationship between the size of the container, the amount of the salt solution (to provide the required R.H.) and the amount of fibre, (4) weighing should be done in the apparatus itself, and (5) the sample should be stored for a sufficient length of time, in which case circulation of the air is unnecessary."—Textile Inst. J. 28: A510.

87. FRANZ. E., and HENNING, H. J. Uber einen neuartigen beregnungsprüfer zur ermittlung der wasseraufnahmefähigkeit und wasserdurchlässigkeit von textilien. Melliand Textil Ber. 17: 926-932. 1936. 304.8 T312

Abridged translation in Textile Mfr., 63: 23. 1937. 304.8 T3126

"A method of determining the absorbing power and permeability to water of textile materials is described in which a weighed sample of fabric is stretched over a drum rotating below a device for producing artificial rain. This device can be adjusted to produce rain in the form of drops or fine jets and its height above the sample can be varied as desired. The drum supporting the fabric is formed from discs held in place by cross bars and is provided with a device for rubbing the inner surface of the fabric and with arrangements for collecting the water passing through the sample. Diagrams of the apparatus are given and its construction is described in detail. After being rained upon for a pre-determined period the drum carrying the sample is rotated rapidly to remove any water adhering loosely to the surface of the sample and the latter is then removed and weighed. Results of tests on wool, cotton, rayon and mixture fabrics are given and discussed. Tests have been made before and after impregnation treatments to render the fabrics waterproof or water-repellent and treated fabrics have been tested after washing. The influence of fabric composition and structure, and type, height of fall and temperature of

87. FRANZ, E. (Cont.)
rain is discussed. The results of tests on wool, staple fibre and mixture yarns are also given; the yarns are wound round the drum for testing. The apparatus may also be used for testing wetting agents."—Textile Inst. J. 28: A222.

88. MITRA, N. C., and VENKATARAMAN, K. A volumetric method for the estimation of moisture. Current Sci. [India] 5: 199-200. Oct. 1936. 475 Sci23

"To det. H_2O in substances such as starch or cotton, distil the sample with toluene or xylene and lead the distillate into a known vol. of Ac_2O and pyridine (1:3). When the hydrolysis is complete, convert the excess Ac_2O into AcOH and acetanilide. Titrate an aliquot part of the soln. with standard NaOH. If x mols. of Ac_2O was taken and the sample contained y mols. of H_2O, the AcOH obtained is x+y mols."—Chem. Abs. 31: 967.

89. SPENCER-SMITH, J. L., and MATTHEW, J. A. A rapid method of determining the moisture content of textiles. Textile Inst. J. 27: T219-T228. Sept. 1936. 73.9 T31

"The method is based on the hygroscopic property of textiles: that if a specimen of given moisture content is placed in a closed container, after a time the moisture content of the textile and the humidity of the air will attain equil. values, and the humidity attained by the air will depend on the moisture content of the material inserted. Provision is made in the app. described for recirculating the air continuously and for measuring its relative humidity. The test generally requires about 20 min. The probable error is about 0.25% regain. The exptl. work was carried out with flax yarns, but the method is considered equally applicable to linen cloth using the same calibration curves, or to other textiles, except that the time required for the test and the calibration curves would have to be detd. separately for each case."—Chem. Abs. 31: 1216.

90. TATE, F. G. H., and WARREN, L. A. The determination of moisture-content by distillation with liquids immiscible with water. Analyst 61: 367-382. 1936. 382 An1

"A review of existing methods of determining moisture content, based on the principle of distillation with water-immiscible liquids, led to the conclusion that the most satisfactory types of apparatus were those due to Friedrich and to Bidwell and Sterling. A modification of the latter is described. An accuracy of 99.5% on a distilled volume of 2 cc. of water is claimed for this improved apparatus and technique. Aromatic hydrocarbons are unsuitable for use as distilling media; paraffins are suitable, and of these commercial heptane is the most useful for general purposes...Comparisons of the results by oven drying and by distillation are recorded for several substances."—Textile Inst. J. 27: A441.

91. ECKERT, P. Neue arbeitsweise zur bestimmung der breitenquellung von textilfasern. Klepzig's Textil-Ztschr. 40: 638-639. 1937.

"By means of a specially designed app. width measurements are made before and after exposure of the textile to a swelling medium. The following typical results are obtained in percentage of width swelling; Australian wool 13.2; German wool, 14.4; silk 8.0; com. viscose fibers I-IV 38.0, 38.9, 40.8 and 34.0; com. Cu staple rayon I-II 41.1, 41.4; special viscose staple rayon 1-4 29.9, 28.9, 31.7 and 34.1."—Chem. Abs. 32: 362.

92. ECKERT, P., and HOINKIS, K. Neue beiträge zur bestimmung der volumenquellung von faserstoffen. Papier Fabrik. 35 (Tech. Teil): 441-443. 1937. 302.8 P197

"The construction and use of an app. is described for detg. the degree of swelling of various natural and artificial fibers."—Chem. Abs. 32: 2344.

93. DE LOUREIRO, J. A. An improved technic in the toluene distillation method for the determination of moisture in food stuffs. Assoc. Off. Agr. Chem. J. 21: 645-648. 1938. 381 As7

"Satisfactory results are obtained in the toluene distillation method for determination of moisture content under the following condition - (1) An apparatus allowing a flow of liquid in the same direction as the flow of vapours must be used, to prevent droplets of water sticking to the walls of the condenser and collecting tube. (2) The collecting tube must be rinsed with a strongly alkaline solution before the determination is begun so that the glass is rendered easily moistened by toluene. (3) Liberation of volatile fatty acids must be prevented by the addition of a small quantity of anhydrous disodium phosphate."—Textile Inst. J. 30: A201.

94. DE LUCA, H. A., CAMPBELL, W. B., and MAASS, O. Measurement of the dielectric constant of cellulose. Canad. J. Res. Sect. B, Chem. Sci. 16: 273-288. Aug. 1938. 330.9 C16C

"A method has been devised for the measurement of the dielec. const. of a material that cannot be made completely to fill a condenser. Two completely miscible liquids are so chosen that the dielec. const. of the material under examn. lies between the 2 values for the liquids. The dielec. consts. of solns. of A and B ranging from 100%A to 100B are measured. A curve is drawn showing the relation between dielec. const. and percentage compn. The condenser used is then partly filled with the fibrous material. The solns. of A and B are introduced into the condenser and the net dielec. consts. are detd. A 2nd curve is drawn showing this relation. The point of intersection of the 2 curves gives the compn. of that liquid that has the same dielec. const. as the fibrous material. This method was applied to the measurement of the dielec. const. of cellulose; benzene and ethylene dichloride were used. A value of 6.1 has been obtained for this const."—Chem. Abs. 32: 9480.

95. GRIFFITHS, C. W. Moisture determination. Indus. and Engin. Chem., Analyt. Ed. 10: 394. July 1938. 381 J825

"An adaptation of the Dean-Stark method (C.A. 14,2145) for high-moisture compds., where a trap is held vertical on an adjustable leveled base. A wooden spool, 35 x 30-35 mm. in diameter, with a 3-mm. hole bored in the center, is beveled and held in the eyepiece with rubber tubing, keeping the eye and meniscus in the same plane."—Chem. Abs. 32: 6505.

96. LANGELAND, E. E., and PRATT, R. W. Improved trap for moisture determination by distillation. Indus. and Engin. Chem., Analyt. Ed. 10: 400-402. July 1938. 381 J825

"The distg. liquid, immiscible with and heavier than water is returned automatically. The use of a surface tension depressant facilitates the correct reading of the water volume."—Chem. Abs. 32: 6506.

97. MATETSKII, A. [Rapid determination of moisture in wool and woolen fabrics.] Sherstianoe [Moscow] Delo 17: 34-39. 1938.

"The method is based on deducing the moisture content from the variations in the dielec. const. of the material. The device used for this purpose must be provided with 2 scales so as to be able to increase the sensitiveness when low moisture contents are detd., because the same abs. change in moisture content has much less effect on the dielec. const. of fabrics with low than with high moisture content. Treatment of woolens with dil. H_2SO_4 increases considerably the dielec. const.; after washing with water and neutralization with 2%, Na_2CO_3 soln., the original value is restored."—Chem. Abs. 33: 2721.

98. MITRA, N. C., and VENKATARAMAN, K. A volumetric estimation of moisture with particular reference to cotton. Soc. Chem. Indus. J. Trans. and Commun. 57: 306-310. 1938. 382 M31

"Cotton is refluxed with Ac_2O in solvent naphtha. AcOH is formed by the interaction of moisture in cotton and Ac_2O. The excess of Ac_2O is changed to acetanilide by addn. of aniline and the free AcOH is detd. by titration with standard alkali. Cf. C. A. 31, 967."—Chem. Abs. 33: 8413.

99. SEYFERTH, H., and MORGAN, O. M. The canvas disc wetting test. Amer. Dyestuff Rptr. 27: 525-532. 1938. 306.8 Am3

"This test consists of measuring the sinking time of a 1-in. diam. No. 6 Mt. Vernon canvas disk under definite conditions of temp. concn. of surface active agent, water hardness and pH. In the test, 500 cc. of the soln. to be tested is placed in a 600-cc. beaker, a Gooch funnel having a 1.5 in diam. and a barrel 3 in. long is inverted in the soln. and the whole is brought to the desired temp. Working rapidly the Gooch funnel is removed, a canvas disk is placed in the funnel and is again inserted in the soln., at the same time starting a stopwatch. The funnel immerses the canvas disk in the soln. about 0.5 in. The time required for the disk to begin to sink is measured and recorded as the "wetting time." Tabular figures show a comparison of the canvas disk and the official wetting tests. The actual max. deviation from the mean wetting time is 11.8% for the official method and 9.4% for the canvas disk method. The efficiencies of surface-active products at low concs. are detd. with greater ease and accuracy than with the official method, and in less time. The app. for this test is available in any lab. Twenty-four references."—Chem. Abs. 32: 8789.

100. DER SIEMENS-holzfeuchtigkeitsmesser. Zellstoff u. Papier 18(3): 129-130. Mar. 1938.

"In this instrument for timber a condenser is charged up to the ignition voltage of a glow lamp, by a hand driven constant voltage generator against the unknown resistance. When the lamp lights, the condenser is discharged down to the discharge voltage of the lamp. The charging takes place according to an exponential function, the lower part of the curve being a straight line. As the ignition voltage of the glow lamp is much smaller than the generator voltage and the latter is proportional to the speed of revolution the moisture in the wood can be read off as a percentage from the number of turns of the driving winch, registered on a counter. A wiring plan and illustrations are given. Moisture contents between 6 and 13 per cent can be measured to an accuracy of ± 1 per cent., and between 13 and 23 per cent to ± 2 per cent.; independently of the kind of wood, the ash content, etc. Paraffined wood can be tested in this way as well as ply wood, but not impregnated wood. Sawdust, cork, linoleum, fish meal, paper, wool, cotton, vistra, and textile mixtures can be tested by the instrument, the readings being multiplied by suitable factors. Silk gives discordant results."—Textile Inst. J. 29: A298

101. STEPHENSON, M. The determination of the dry weight of cotton by means of the commercial ventilated drying oven. Textile Inst. J. 29: T297-T304. Dec. 1938. 73.9 T31

"When cotton dried in a com. ventilated drying oven is transferred to a container and weighed on an external balance, the weight obtained is generally lower than if the dried cotton had been weighed in the oven. The differences are principally due to the introduction of errors when the samples are weighed on the external balance, so the oven method is considered more accurate. The errors in the external balance are apparently due to 2 causes, namely, the absorption of moisture by the sample during transference from oven to container, and an effect due to the warm air inclosed with the cotton. The net error may be expected to vary from 0.2% (of the dry weight) too heavy to 0.5% too light, whereas in the oven method the net result of the errors ("balloon effect", convection currents, etc.) may be as much as 0.1% less than the correct dry weight."—Chem. Abs. 33: 6058.

102. ADAM, N. K., and SHUTE, H. L. The determination of contact angles on thin wires or single textile fibres. In International Society of Leather Chemists. Wetting and detergency. ed. 2, p. 53-56. New York, Chemical Pub. Co., 1939. 386 In8

Method for wetting single textile fibers. Wetting procedure preliminary step to swelling.

103. BECKEL, A. C., SHARP, A. G., and MILNER, R. T. Apparatus for determining moisture by the distillation method. Indus. and Engin. Chem., Analyt. Ed. 11: 425-426. 1939. 381 J825

"A new apparatus for the determination of moisture by the distillation method is described, in which the removal of droplets of water forming on the walls of the condenser is accomplished automatically and the milky suspension forming in the receiver is eliminated by automatic redistillation."—Textile Inst. J. 30: A738.

104. BUNDESMANN, H. Eine prüfapparatur zur wasseraufnahmebestimmung von loser zellwolle. Deut. Wollen-Gewerbe 71: 1208-1210. 1939.

Illustrated.

105. *HEINRICI, F. A. [Moisture content measuring apparatus.] (Abs.) British Pat. 502, 525 of 1/7/1938: 20/3 1939.

"In apparatus for measuring the moisture content of paper or similar materials in sheet or thin plate form, the material to be tested is connected in the gridcathode circuit of a thermionic valve the anode current of which varies according to the moisture content. The material is connected in the circuit by means of a device comprising two adjacently located plates and a pressing-on plate of insulating material located opposite to the electrodes between which the material under test is stationarily and firmly clamped so that it is pressed on the one side by the two electrodes which feed the current to the material and on the other side by the pressing-on plate."—Textile Inst. J. 30: A403.

106. LEPPIN, H. Die wasserentfernung aus geweben durch schleudern, absaugen und trocken. Monatsh. f. Seide u. Kunstseide 44: 91-94. 1939.

"In wet fabrics water is held between the yarns, between the fibres of which the yarns are composed, and also as water of swelling in the fibres. Mechanical processes, such as centrifuging, suction and squeezing, remove only the water between the yarns and fibres, and the water of swelling can only be removed by drying processes. Tables and graphs are given showing the changes in moisture contents of cotton, wool, silk and rayon fabrics on centrifuging and subjecting to suction, and the changes in the moisture contents and temperatures of the fabric and the hot air in a drying process. Details are given of temperatures, moisture contents, etc. of air and fabric on entering and leaving a drying chamber, temperatures in the chamber, volumes of air used, heat and steam requirements, etc. in a fabric drying process."—Textile Inst. J. 30: A393.

107. MILONE, M. and GRANDIS, E. Di un nuovo metodo di determinazione dell'umidità nei materialicellulosici. Ann. di Chim. Appl. [Rome] 29: 130-134. 1939. 385 An7

"The moisture in textile fibers can be detd. by measuring the f.-p. lowering of CCl_3CO_2H by the H_2O present in the fiber. The Beckmann app. is used. The moisture is detd. by the formula: $\% H_2O = (\triangle X 18.016 X p_0)/(122.7 Xp)$, in which $\triangle$ is the f.-p. lowering, 18.016 and 122.7 are the mol. wts. of water and the acid, resp., and p_0 and p are the wts. of acid and fiber used, resp."—Chem. Abs. 33: 9656.

108. THE SHIRLEY moisture meter, a new testing appliance of great utility to textile trades. By a technical correspondent. Textile Weekly 24: 745-748. 1939. 304.8 T3127

"The Shirley Moisture Meter comprises an electrode system for measuring the electrical resistance of a sample of cotton and an indicating system which indicates the moisture regain of the sample directly. The electrode system consists of a cylindrical stainless steel core surrounded by ebonite and enclosed in a nickel sheath. It is pressed on to the sample with a force of about 45 lb. wt. A mechanical constant pressure device has been designed in order to relieve the fatigue to a routine tester. The electrical resistance measured is that of the cotton bridging the gap between the inner core and the outer sheath of the electrode system. An amplifying valve is employed to build up the current and make possible the use of Record 'Cirscale' indicators which have easily read circular scales and give accurate readings over clearly marked dials. The apparatus is portable and may be worked from any ordinary A.C. electrical supply. It can be used for measurements on raw cotton and on grey cotton yarns in any form of package over a range from 4.5 to 15 per cent. regain. With the aid of conversion tables the instrument can also be used for testing bleached cotton and yarn, cotton cloths in various states of finish, and also various other textile materials with the exception of silk or acetate rayon. Oven and meter tests on a large number of cottons and yarns have demonstrated the essential accuracy of the Moisture Meter."—Textile Inst. J. 31: A98.

109. TROGNITZ, K. Wasserbestimmungen mit dem heraeus-trockenschrank. Ztschr. f. das Gesam. Getreidewesen 26: 138-143. 1939. 59.8 Z3

"The standard method of detg. moisture with this const. temp. elec. oven is outlined briefly for comparison with the more rapid method which is also described. For the latter method, which involves the drying of the sample at 130° C. for 1 hr. or at 135° C. for 50 min., the drying oven is modified by having a balance attached. This permits of weighing out the sample and weighing it back without removal from the oven. The rapid method is considered to give results in good agreement with those by the standard method, which involves drying at 150° C. for a min. of 4 or a max. of 6 hrs. The exptl. error is reported as 1.7% by the rapid method and as 0.2% by the standard method."—Chem. Abs. 33: 8450.

110. BAKHMAN, L. [Apparatus for determining the moisture in wood.] Aviapromyshlennost, No. 2, p. 76-78. 1940.

"An app. is described for detg. the moisture content in wood by measuring its elec. cond. The moisture can be detd. with an error of ± 1% for the interval of 8-25% moisture in the wood. A diagram of the app. is included."—Chem. Abs. 34: 4616.

111. BLOW, C. M., and MOXON, B. F. J. A new method of determining the wettability of textile fibers. Soc. Chem. Indus. J., Trans. and Commun. 59: 171-174. 1940. 382 M31

"The wettability, interfacial tension water/fiber, is detd. by measuring the water penetration pressure of a plug of fiber in a brass tube, the water pressure being increased at a standard rate. To eliminate the effect of different pore sizes the air permeability is detd. as the time taken to force a given vol. of air through the plug. The effect of various treatments on the wettability of wool is detd."—Chem. Abs. 34: 8289.

112. ECKERT, E., and WULFF, P. Die bestimmung des wassergehaltes (Auszug). Angew. Chem. 53: 403-405. Aug. 31, 1940. 384 Z33

Extract from Beiheft Zeitschrift des Vereins deutscher Chemiker, No. 39, 12 p. Original article has 120 bibliographical references.

All methods of water determination are discussed, with the exception of that in gases. The advantages and disadvantages of the various methods are presented.

113. JONES, E. H. A moisture meter for textile materials. J. Sci. Instruments 17: 55-62. 1940. 297.8 J82

"Many oven-dried textiles gain moisture on exposure to the air in such manner that a nearly linear relation exists between the log of the elec. resistance and the amt. of H_2O regained. An app. is described in which novel electrodes are used which avoid variations in resistance. A wide range of resistance is covered by interchangeable electrodes. The instrument employs common types of thermionic valves in a circuit so designed that simple adjustments can be made to correct for differences in the emission of valves and variations in voltage without altering the original calibration. Different electrodes are used for cotton and wool. The method does not apply to silk or acetate rayon which have very high resistance."—Chem. Abs. 34: 4583.

114. SIEGENHEIM, M. (to the firm M. Rudolf Jahr). Process and device for the determination and regulation of the moisture content of lengths of material. U. S. Pat. 2,189,352, Feb. 6, 1940.

"App. is described, and a process for detg. the moisture content of lengths of material by ascertaining their elec. cond. consisting in conducting off the natural electricity from the length of material, producing a static electricity value influenced by the moisture content in the length of material and measuring this static electricity value to ascertain the cond. and consequently the moisture content."—Chem. Abs. 34: 4286.

115. SKINKLE, J. H. Moisture determinations; relative humidity, regain. In his Textile Testing, p. 5-22. New York, Chemical Pub. Co., 1940. 304 Sk3

Also in Amer. Dyestuff Rptr. 26: 529-536. Sept. 6, 1937. 306.8 Am3

"Four methods are discussed: xylol method; relative humidity in equilibrium with sample; vacuum desiccator with drying agent, drying ovens (low temperature, using dry air; high temperature, using air from room). It is stated that the first three of these methods are comparatively unimportant. The use of drying ovens at 220-230° F. is discussed at some length."—Inst. Paper Chem., Bibliog. Ser. 160: 69.

116. WIEGERINK, J. G. Equipment for conditioning materials at constant humidities and elevated temperatures. Textile Res. 10: 334-340. 1940. 304.8 T293

"Equipment is described for the study of the moisture relations of textiles in air of controlled relative humidities at elevated temps. The equipment was used at temps. from 35° to 149° relative humidities from 10% to 90%, for temps. up to 100° and to the max. relative humidities obtainable at atm. pressure for temps. between 100° and 149°. The temp. in the working chamber can be maintained const. within 0.2° and the relative humidity within ±1% for exptl. runs of several days' duration. Data are included."—Chem. Abs. 34: 4919.

117. AHMAD, N. An automatic device for recording the moisture content of hygroscopic materials. Natl. Inst. Sci. India, Proc. 7(1): 79-87. 1941. Libr. Cong.

"The app. consists of a controlled humidity chamber, balance and intermittent recorder. The end of the balance beam supporting the pan within the chamber is also connected to a pen which is periodically pressed against a revolving drum. The app. was employed to study the response of different varieties of cotton to the same humidity. Moisture regains detd. by the oven method agree with those detd. by the balance method. The moisture-absorbing capacity of cotton is not influenced by botanical species. Up to 60% humidity the absorption is the same for all cottons. The hygroscopic properties are not significantly affected by length or fineness of staple."—Chem. Abs. 35: 7237.

118. HEERTJES, P. M. The density and sorptive capacity of some samples of cotton, silk and wool. Part III. Determinations on Egyptian cotton. Rec. des Trav. Chim. des Pays-Bas 60: 689-699. 1941. 385 R24

"Values are given for the d. of cotton, dyed and undyed, in H, He, and air, as well as the apparent d. in air, H, water and benzene. From these experiments it can be determined that with cotton dyed with substantive dyes, the cotton substance is unchanged and the dye is between the micelles. Air and H are adsorbed by cotton. The amt. of adsorbed gas is not affected by the dyeing operation. Consideration is given to the phenomenon of dyeing as related to the development of the surface and hydrophilic nature of the textile fibers, and also as affected by the specific behavior of the dyestuff, (i. e., whether the dyestuff dissolves in the fiber, reacts with the fiber, or is adsorbed on the fiber)"—Chem. Abs. 37: 1275.

119. MAHLO, H. Elektrische messung des feuchtigkeitsgehalts von zellwolle und anderen textilen fasern. I-IV. Melliand Textil Ber. 22: 407-409, 609-613; 23: 67-69, 105-108. 1941-42. 304.8 T312

"Equipment and methods are described for the determination of the specific resistance, dielectric constant and dielectric loss on fabrics. Curves are given showing the relationship between each of these types of electrical measurements and the moisture content of staple rayon and other fibers. The methods and their accuracy for estimating moisture content are critically evaluated."—Chem. Abs. 37: 1873.

120. SLOWINSKE, G. A. The evaluation of water-resisting textile finishes. Amer. Dyestuff Rptr. 30: P6-P14. 1941. 306.8 Am3

"A description of general testing procedures used in the trade and of 3 proposed simplified testers for water-resistance. The testers used for a period of 5 yrs. are: (1) a hydrostatic pressure tester, (2) a spray tester and (3) an immersion tester."—Chem. Abs. 35: 1233.

121. CASSIE, A. B. D. The porous plug and fibre diameter measurement. I. A practical method of wool fibre diameter measurement. Textile Inst. J. 33: T195-T204. Dec. 1942. 73.9 T31

"Wool is more fortunate than cotton in that the fibres are roughly circular in cross-section, and direct measurement of the diameter by means of a microscope gives all that one requires about the diameter of the fibres. But microscope measurements are tedious, and to get even a fair average for the diameter, some 500 or more observations have to be made." - Introduction.

"The plug method gives a simple and useful means of measuring the mean diameter of wool fibres provided these are free from kemp. The calculations required have been simplified as far as possible and a value is given for the shape factor which is applicable to plugs with parallel pores and a porosity around 35 per cent. The density of wool must be taken as 1.35 gm./c.c. if the plug measurements are to give consistent values of diameter for different porosities. The thickness of any oil film on the fibres is included in the diameter deduced from plug measurements, and it is recommended that oil should be removed from the fibres before measurements are made. Plug measurements are sensitive to regain of the fibres, and it is essential that the wool should be conditioned and that the measurements should be made at constant temperature and relative humidity."—Author's summary.

122. LIPPKE, P. [Moisture determination on fibrous surfaces.] Ger. Pat., 724,042, July 9,1942 (Cl. 42l. 9.51).

"The moisture on such surfaces is detd. with the aid of an electric condenser or a magnetic alternating field."—Chem. Abs. 37: 5674.

123. TENTATIVE textile standard no. 4, 1940. Moisture in relation to textile materials. Textile Inst. J. 33(6): S3-S6. June 1942. 73.9 T31

"Published as a Tentative Textile Standard in January 1940, and January 1941. As provided in the Textile Institute's Standardisation Scheme, this Standard has now been revised and will be issued by the British Standards Institution as a British Standard (Textile)."

Contents: Section I. Definitions. Section II. Method of testing (relative humidity; over-dry weight) Appendix I. Standards of regain.

124. BOGATY, H., and CARSON, F. T. Measurement of rate of flow of water through filter paper. U. S. Natl. Bur. Standards. J. Res. 33: 353-362. Nov. 1944. 157.88 J82

"A method is described for measuring the rate of filtration of water through filter papers, in which the paper is used as a cone in the usual manner and special apparatus is not required. An equation is derived, with which a water-filtration coefficient is determined from the filtration data. Data are presented also to show the effect of continued filtration on this coefficient. A correlation is shown between the air permeability of filter paper and the rate of filtration, enabling one to make a good estimate of the speed of a filter paper without wetting it. A definite procedure is recommended for determining the rate of flow of water through filter paper."—Author's abstract.

125. JAYME, G. Mikro-quellungsmessungen an zellstoffen. Papier Fabrik., No. 6, p. 187-194. June 1944. 302.8 P1933

"The microcentrifugal method used for the determination of swelling value of regenerated cellulose such as rayon and staple fiber can be used for pulps. The swelling value Q (Quellungswert,% increase in wt.) = 100 (the wet wt. minus the dry wt. after the entire treatment) divided by the oven-dry wt. after the treatment. The method is accurate for aqueous swelling to ±1.2% provided the pulp is uniform and free from splintered wood fragments. The method allows quantitative measurement of swelling changes in pulps simply and quickly. Such swelling changes can be measured as the "irreversible cornification" caused by drying which is dependent on the intensity of the drying and the original swelling capacity, the increase of swelling with time, the increase due to bleaching, the decrease of the swelling value of beaten and unbeaten pulps on heating, the increase of swelling during beating, the influence of water on the behavior during beating and the increase in swelling value produced thereby, and the decrease of swelling value brought about by electrolytes. These measurements afford an explanation of the decrease in strength of sheets formed from beaten pulps which were heated while in suspension. The new method is preeminently suited to explain relationships between the swelling values of pulps and their behavior in technical processes such as beating, and sheet formation as well as the relationship to sheet strength." - Translation of "Zusammenfassung". Chem. Abs: 40: 3898.

126. MANDIKOS, G. J., and RYBERG, B. A. A comparison of the A.A.T.C.C. and Suter hydrostatic pressure testers. Amer. Dyestuff Rptr. 34: P37-P40. Jan. 15, 1945. 306.8 Am3

"Results on various materials at 15-38° give an av. factor of 1.32 x Suter - 4 = A.A.T.C.C. results at 27°±3°."—Chem. Abs. 39: 5494.

127. KIME, H. B. A study of the water resistance of fire, water, and weather resistant cotton canvas. Amer. Dyestuff Rptr. 35: 261-264. May 20, 1946. 306.8 Am3

"The water resistance of fire, water, and weather resistant cotton canvas has been investigated. Several test procedures including a water permeability test, a hydrostatic pressure resistance test, and a water absorption test were utilized. A spray penetration test simulating severe service conditions is described. The test data indicate that treated canvas possesses excellent water shedding properties when subjected to a spray penetrating test. The three other water resistance tests duplicate each other to some extent in that a general agreement in the ranking of the test samples in these tests was noted."—Author's summary.

128. LANDSBERG, M. I., and MOODY, F. J. Devices for producing artificial rainfall for tests of water-repellent and waterproof materials. Textile Res. 16: 211-218. May 1946. 304.8 T293

"The development of devices for the production of simulated rainfall was initiated by the Quartermaster Corps for use in the evaluation of water-repellent characteristics of textile fabrics and garments. In order to simulate natural rainfall, intensities, drop sizes, and drop velocities similar to those found in natural rainfall must be produced. Three nozzles furnishing approximately 0.1, 1, and 3 inches of rainfall per hour, respectively, have been developed to accomplish this purpose. Measurements have indicated that the sizes of the drops produced by the three nozzles agree quite well with the sizes of the drops found in natural rains of similar intensities. Correct positioning of the nozzles with respect to height and angular orientation has made it possible for the drops to attain terminal velocity before striking the test subject. Drop sizes were measured by catching the drops in flour, drying and sorting the pellets formed by the drops through a series of standard sieves, and determining the pellet size distribution by means of a calibration curve relating pellet size to drop size. Drop-velocity measurements were made by photographing a waterdrop at varying heights of fall, using stroboscopic light as the source of illumination. Intensity measurements were made by catching the falling drops in cylindrical containers spaced at 2-foot intervals throughout the test area, measuring the volume of water collected, and calculating it in terms of inches of rainfall per hour. A number of variables were studied in the development work, such as water pressure, nozzle height, design, and orientation with respect to the horizontal."—Author's abstract.

129. SOOKNE, A. M., and others. A drop-penetration apparatus for evaluating water repellent fabrics. Amer. Dyestuff Rptr. 35: 295-298, 307-308. June 17, 1946. 306.8 Am3

A. M. Sookne, F. W. Minor, J. E. Simpson, and M. Harris, joint authors.

"A description has been given of a drop-penetration apparatus suitable for evaluating the resistance to hard rainfall of cotton flat fabrics. The results obtained with this device correlate well with those obtained in hard natural rain. Some typical results obtained for cotton flat fabrics are presented, and the relationships between the results obtained with this apparatus and some other measures of water repellency are discussed. It is shown that tests of the resistance to hydrostatic pressure may provide an erroneous estimate of the resistance of a fabric to penetration by falling drops."—Authors' conclusion.

EFFECTS OF MOISTURE ON PROPERTIES OF CELLULOSE FIBERS

130. SCHLOESING, T. J. Sur les propriétés hygroscopiques de plusieurs matières textiles. Paris Acad. des Sci. Compt. Rend. 116: 808-812. 1893. 505 P21

"The author considers that in determinations of the hygroscopic properties of various compounds sufficient attention has not been given to the influence of temperature and the coefficient of saturation of the atmosphere. In the case of cotton, wool, merino, and silk, however, the influence of temperature, although distinct, is comparatively small, and this seems to be true also of some other materials. Curves are given showing the relation between the temperatures and the quantity of water absorbed by the textile fabrics specified, when they are allowed to remain for a long time in contact with air having a known coefficient of saturation."—London Chem. Soc. J. 64(II): 368. 1893.

131. RAKOVSKII, A. V. [Adsorption. XI. Hysteresis of the degree of hydration of cellulose.] Russ. Fiz. Khim. Obshch. Chast. Khim. Zhur. 47: 18-21. 1915. 385 R89

"An exam. of cotton, paper, flax and hemp with respect to the amt. of H_2O they are capable of retaining in vacuo showed that the max. of hysteresis for cellulose (1.8% H_2O) is slightly lower than for the starches as found in former investigations. Several tables and curves illustrate the results."—Chem. Abs. 9: 1567.

132. LEIGHTON, A. The adsorption of caustic soda by cellulose. J. Phys. Chem. 20: 32-50. 1916. 381 J822

"Most, and perhaps all, of the adhering liquid may be removed from cotton by centrifuging for an hour at 4000 r.p.m. An analysis of the cotton gives the amt. of NaOH adsorbed, subject to a correction for any failure to get the cotton dry. Data obtained in this way gave a smooth adsorption curve. There is no evidence of the formation of a compd. when cotton is treated with NaOH for concns. up to 500 g. NaOH per l. Mercerization of cotton is not due to the formation of any compd. of cellulose and NaOH. Until the amt. of adsorbed NaOH is 0.34 g. per g. of cotton there is apparently no displacement of H_2O from the cotton, but there is a decrease in the amt. of H_2O adsorbed for amts. of NaOH higher than this. A standard and reproducible cellulose may be obtained by heating absorbent cotton with 1% NaOH for 18 hrs. on the water bath."—Chem. Abs. 10: 824.

133. SCHWALBE, C. G., and BECKER, E. Zur kenntnis der zellstoffschleime. III. Die hygroskopizitat schleimhaltiger papiere in mit wasserdampf gesättigter luft. Ztschr. f. Angew. Chem. 33(1): 58-59. 1920. 384 Z33

"Parchment ('pergamyn') cellulose and parchmentized paper and similar products have a moisture content of 6-8% after exposure to the ordinary atm., but after exposure for 4 hrs. in air satd. with water vapor the water content increases to 17-26%. Previous heating at 120° diminishes this property of absorbing water."—Chem. Abs. 14: 3528.

134. MATTHEW, J. A. The diameter of yarns. Textile Inst. J. 12: 469-472. Dec. 1921. 73.9 T31

"The diameter of a yarn is shown to be inversely proportional to the square root of the count multiplied by the apparent density of the yarn. A simple and rapid method of measuring the apparent density of yarns is described and shown to be capable of giving consistent results. An extensive comparison is then made between the diameter

of flax and cotton yarns measured by a micrometer or by a microscope, and by the density method; in every case the agreement is very good. With finer yarns made from Courtrai flax, the micrometer results are less regular than those from the density method. It is concluded, therefore, that the average diameter of yarns may be more accurately determined from the average of about five observations of the apparent density than from the average of many hundreds of readings with a micrometer. It is shown that the diameter of yarns of the same count may vary appreciably according to the source and nature of the material. Thus, if the yarns examined are typical, Irish flax yarns are coarser than Courtrai flax yarns, and cotton is coarser than either, for equivalent counts. The difference is not due to the absolute density of the fibres being different, but probably is connected with the shape and area of cross-section of the fibres. An estimate is made of the percentage air space in yarns from the apparent density of the yarn, and the density of the fibre. It is also shown that if the yarns were compressed to exclude all the air, the diameter would then be

$$\frac{\text{apparent density of yarn}}{\text{density of fibre}}$$

times the diameter in the natural condition. (For flax yarns this factor is about 0.8). Some results are given showing the effect of twist in the yarn on the diameter and on the apparent density. It appears that there is a slight increase of diameter as the twist increases. The apparent density reaches a minimum value, after which it increases; and from this it is concluded that there is a critical twist factor about 1.65-1.7, at which the yarn attains a smooth surface and a full appearance. A number of results are given showing the apparent density of yarns made from a variety of fibres."—Author's summary.

135. WILLOWS, R. S., and ALEXANDER, A. C. Change in section of cotton hairs on mercerizing. Textile Inst. J. 13: 237-240. Dec. 1922. 73.9 T31

The increase in area on first wetting out with water was found from a number of experiments to be from 40 to 42%.

136. WILSON, R. E., and FUWA, T. Humidity equilibria of various common substances. J. Indus. and Engin. Chem. 14: 913-918. 1922. 381 J825

"An article for general reference contg. data on the humidity equilibria of numerous substances and purporting to be accurate within 0.5%. For a const. relative humidity, there is surprizingly little change in the equil. H_2O content of most substances over the ordinary range of indoor temps. The following generalized data give the % H_2O content on a dry basis for 50% and 90% relative humidity, resp., for the particular group of substances; finely divided inorg. substances, C and lamp blacks, coke, rubber, cellulose acetate and silk, 0-4, 0-6; foods (except macaroni), paper and pulp fibers, glue, fuller's earth and linen, 4-8, 8-19; artificial and natural textile fibers (except cellulose acetate), macaroni, feathers, wood, soap, catgut and $Fe(OH)_3$ gel, 8-12, 13-26; absorbent cotton, leather, cigaret tobacco, SiO_2 gel and activated charcoal, 12-28, 22-50."—Chem. Abs. 16: 3803.

137. CLEGG, G. G., and HARLAND, S. C. The measurable characters of raw cotton. I. The determination of area of cross section and hair weight per centimetre. Textile Inst. J. 14: T489-T492. Dec. 1923. 73.9 T31

"1....Methods for the evaluation of mean area of cross section and hair weight per centimetre are described. 2. To obtain a mean value subject to a maximum probable error of not more than 3% of the mean entails great care in sampling, and the following minimum number of observations:-

140 for area of cross section
80 to 160 for hair weight per centimetre.

3. Data on area of cross section and hair weight per centimetre are presented for five cottons, but the existence of an unknown amount of expansion when the hair is cut renders the figures for area of cross section of doubtful value except for comparative purposes. 4. Calculations of specific volume, apparent density, and porosity of four cottons show that the amount of pore space varies from 32% to 41%, and, in general the amount of pore space increases with the coarseness of the cotton."—Author's summary.

138. COWARD, H. F., and SPENCER, L. The absorption of caustic soda solutions by cotton. Textile Inst. J. 14: T32-T45. Jan. 1923. 73.9 T31

"Detns. were made of the compn. of the solid phase when cotton, free from the bulk of its so-called impurities, is immersed in NaOH solns. of various strengths, and also when the cotton is subsequently washed in other strengths of the same alkali or in water. The expts. of Gladstone, Vieweg, Miller and Leighton are reviewed. With the aid of a suitable centrifuge the authors have made what they believe to be the first direct detn. of both the water and the NaOH present in the alkali satd. fiber. Detailed descriptions are given of expts. made to det. the following points: (1) H_2O and NaOH absorbed by loose cotton fibers, (2) H_2O and NaOH absorbed by a cotton fabric, (3) preferential absorption of NaOH in fiber and in fabric, (4) H_2O absorbed by cotton (fiber) after removal of NaOH, (5) hysteresis in the absorption of NaOH solns. The results of these detns. are assembled in 5 tables of figures and are illustrated by 9 charts of curves. The curves for total NaOH absorbed are complex and give no indication of the formation of definite chem. compds., nor are they of the form commonly found for simple adsorption. The preferential absorption of NaOH by loose fiber is approx. proportional to the concn. of the soln. in contact with the cotton. In this case also there is no evidence of the formation of definite compds., but the form of the curves is not inconsistent with the view that compds. of the general formula $(C_6H_{10}O_5)m.(NaOH)_n$ are formed. Cotton hairs swell to an increasing extent, as the % of NaOH rises, up to a limit of nearly 3 times the original vol. This limit is reached at about 14.3% NaOH and no further swelling occurs in stronger alkali. It is concluded that the cuticle of the fiber is responsible for this limitation, since the contents of the fiber are capable of much greater swelling when not restrained by cuticle. Similar results are obtained with cotton hairs in yarn or fabric except that the max. swelling is then much less because of the constraint imposed by the fabric as a whole on the individual hairs. There is a general parallelism between the technical results of mercerization and the swelling deduced from the expts. The expts. are also made to account for the superior results obtained in mercerizing yarn as compared with mercerizing cloth. The residual swelling in fiber which has been mercerized and washed is shown to be closely proportional to the absorption of benzopurpurin 4B, as measured by Knecht; and the diminished swelling of such fibers on soaking in water after drying has been correlated with their well known diminished "affinity" for dyestuffs after drying. Marked hysteresis in the shrinkage of cotton fiber on replacement of mercerizing solns. by weaker solns. has been observed, and the results give a reason for the necessity in technical operations for retaining cloth under tension until almost the whole of the NaOH has been removed."—Chem. Abs. 17: 1553.

139. DENHAM, H. J. The structure of the cotton hair and its botanical aspects. II. The morphology of the wall. Textile Inst. J. 14: T86-T113. Apr. 1923. 73.9 T31

This paper aims at giving as briefly as possible a resume of existing information on the structure of the cotton hair, and of such parallel instances in general botanical literature as can be used to throw light upon it. 97 references.

140. CALVERT, M., and HARLAND, S. C. The measurable characters of raw cottons. III. An approximation to the original cell diameter. Textile Inst. J. 15: T8-T9. Jan. 1924. 73.9 T31

Swollen diameter as a measurable character of the cotton fiber.

141. COLLINS, G. E. The stress strain relationships of cotton hairs. The time factor. Textile Inst. J. 15: T519-T528. Nov. 1924. 73.9 T31

"The change in dimensions of single cotton hairs under longitudinal stresses was investigated in relation to the time of application of the loads, and it was found that elongation and recovery from strain are irregular processes which may continue for long periods of time, though frequent repetition of the loading conditions tends to the establishment of an elastic state. Cotton hairs in water when loaded longitudinally exhibit an irregular extension, but the recovery from strain is a smoother process."—Soc. Chem. Indus. J. Brit. Chem. Abs. B. 44: 35.

142. PEIRCE, F. T. The influence of humidity on the elastic properties of cotton. The rigidity of raw cotton hairs at 20°C. On the modulus of rigidity at 20°C. Textile Inst. J. 15: T501-T518. Nov. 1924. 73.9 T31

"The variation of the rigidity of raw cotton hairs with the humidity of the atmosphere is considerable, the value in air saturated with moisture being less than one-sixth that in dry air. The decrease is rapid in the ranges 1-10% and 90-100% humidity, whilst in the intermediate range there is an approximately regular decrease with increasing humidity. The water vapour in the air affects the elastic properties of the cotton only indirectly; the immediate cause is the absorbed moisture. The rigidity is halved by the addition of 10% of moisture. Rise of temperature decreases the rigidity at constant moisture regain and this is only partially counteracted by the decrease of absorbed moisture when the relative humidity remains constant. As regards the modulus of rigidity the different values obtained for different hairs are mainly due to differences of hygroscopicity; fully thickened hairs absorb less moisture, the difference being due to difference of porosity. When the logarithm of the rigidity is plotted against the moisture regain, given by the figures of Urquhart and Williams (B., 1924, 372) the points lie in a straight line. The theory is advanced that water molecules are absorbed first in a definite relation to individual cellulose groups, but later in a less intimate manner. The water first absorbed and firmly bound produces the alteration in elastic properties, but little vapour pressure, whilst that absorbed later and less firmly bound has little effect on the cohesion but determines the vapour pressure and the progress of chemical reactions."—Soc. Chem. Indus. J. Brit. Chem. Abs. B. 44: 35.

143. SCHWALBE, C. G., and TESCHNER, G. Zur kenntnis der adsorption und quellung bei cellulose- und zellstoff-fasern. Papier Fabrik. 23 (Fest- und Ausland-Heft): 144-148. 1925. 302.8 P197

"Pure cotton fibers, in the dry or swollen condition, do not show a sp. adsorption capacity for highly dil. Al salt solns., contg. 0.15% Al_2O_3, which confirms the investigation of Tingle (C.A.16, 1314). The age and surface condition of the fiber play important roles in adsorption phenomena. The presence of surface decompn. products such as oxy-and hydrocelluloses, effect a marked adsorption capacity after the fibers have been exposed to H_2O for a long time. Cotton fibers adsorb 0.186% Al_2O_3 after 4 hrs. and 0.671% after 12 hrs. from a 1.15-1.20% basic $Al_2(SO_4)_3$ soln. The apparent contradictory results of S and Robsahm (C.A.6, 2526) and Tingle on the adsorption from $Al_2(SO_4)_3$ solns. may be explained by the difference in degree of beating and swelling of the wood pulps used. Since increased swelling of the fibers increases the adsorptive power, the latter may be used as a measure of the former."—Chem. Abs. 19: 3017.

144. BERNARDY, G. Die bestimmung des quellungsgrades der cellulose mit hilfe der Schwalbeschen hydrolysierzahlmethode. Ztschr. f. Angew. Chem. 39: 259-261. Feb. 25, 1926. 384 Z33

"The Schwalbe hydrolysis no. method for detg. the amt. of swelling has given very unsatisfactory results to several investigators. The method is to hydrolyze the finely cut cellulose exactly 15 min. with boiling 5% H_2SO_4, neutralize with 40% NaOH, add Fehling soln., again boil exactly 15 min., collect the Cu_2O, dissolve in HNO_3 and det. electrolytically. B. shows that the errors and variations are due to inexact neutralization of the acid and describes a slight modification of the app. to obviate this."—Chem. Abs. 20: 3806.

145. MORTON, W. E. The importance of hair weight per centimetre as a measurable character of cotton and some indications of its practical utility. Textile Inst. J. 17: T537-T552. Oct. 1926. 73.9 T31

Correlation between square of mercerized hair width and hair weight per cm.

146. OBERMILLER, J., and GOERTZ, M. Die abhängigkeit des feuchtigkeitsgehaltes der textilfasern von der herrschenden luftfeuchtigkeit. Melliand Textil Ber. 7: 71-76. 1926. 304.8 T312

"The results of several tests made over satd. solns. were somewhat at variance with commonly accepted figures. The regain of cotton at 20° and 65% humidity is given as 9.5%; that of wool, 16.5-17.0%; of raw silk, 13.5%; of degummed silk, 11.5-12.0% and of rayon, 15.0%. The absorption of H_2O by textile fibers varies inversely as the temp. but is not appreciably influenced by customary changes in the barometric pressure."—Chem. Abs. 21: 2802.

147. PARKER, R. G., and JACKMAN, D. N. Some effects of humidity on the properties of fabrics, with special reference to the control of humidity during strength tests. Soc. Chem. Indus. J. Trans. 45: 47T-54T. 1926. 382 M31

"Publication No. 24 of the British Launderers' Research Association."

"Perfectly dry fibers take up moisture from the atm. and attain their equil. rapidly, the H_2O content at 70% relative humidity varying from 6 to 12.4% in the order celanese, cotton, linen, silk, wool, viscose. Mullen bursting strength tests upon samples of fabric in equil. with atms. of varying relative humidity showed a slight increase in strength for cotton and mercerized cotton with rising humidity. Linen increased 25% when wet. Other fabrics lose in strength as the humidity rises. These changes are temporary and the fabric reverts to its original strength when reconditioned at normal (70%) humidity. One% Na oleate soln. at 60° decreases the strength of silk and wool, but has no further effect on rayon. The oleate soln. weakens wool, silk, and celanese to a greater extent than 1% Na_2CO_3."—Chem. Abs. 20: 1720.

148. PEIRCE, F. T., and STEPHENSON, R. J. The effect of humidity on cotton yarn. The strength and extensibility of sized and unsized warp yarns in equilibrium with steady atmospheric conditions. Textile Inst. J. 17: T645-T660. Dec. 1926. 73.9 T31

"The nature and extent of the well-recognised influence of atmospheric humidity on the properties of cotton yarn are of direct interest in three connections, namely its effect as a condition of (a) spinning, on the yarn produced, (b) testing, on the numerical result, and (c) weaving, on the loom breakages. In the present paper, the first problem is not explicitly considered, the second is elucidated as the data were obtained by testing, but the experiments were devised to throw as much light as possible on the third question."—Author's introduction and summary.

149. DAVIDSON, G. F. The specific volume of cotton cellulose. Textile Inst. J. 18: T175-T186. May 1927. 73.9 T31

"The object of this study was to det. the sp. vol. of cotton in water, some org. liquids and He, in the hope that the results obtained might throw some light on the conditions existing at the internal surfaces of cotton when it adsorbs a vapor or liquid, and on the structure of cotton itself. Later, the work was extended to include the detn. of the effect on the sp. vol. of such processes as mercerization and regeneration from the xanthate from nitrocellulose and from cuprammonium soln. The sp. vols. in He, H_2O and toluene of various natural cottons and artificial silks were measured. In every case the He value was about 1% lower, and the H_2O value 3 to 5% lower than the toluene value. The sp. vol. varies with the variety of cotton, and mercerized cottons and artificial silks have a larger sp. vol. than soda-boiled cotton. In both water and toluene the apparent sp. vol. of a soda-boiled cotton increases linearly with the temp., although the slopes of the lines are different in the 2cases."—Chem. Abs. 21: 2988.

150. STACEY, A. E. Status of textile regain data. Established curves- Allowing for fiber mix - Effect of high speed. Textile World 72: 2529-2531. 1927. 304.8 T315

"Charts are presented comparing the results of several investigators on the regain of absorbent cotton and mercerised bleached and mercerised unbleached cotton, and showing the effect of humidity on the breaking load and elasticity of cotton, silk, and wool. From the results of tests to determine the effect of relative humidity on the extension of artificial silk it appears that there is a sudden diminution of resistance to stretch at 62% humidity which, therefore, is the upper limit of humidity at which artificial silk can be successfully prepared for manufacture. The investigations also indicate that mixed fabrics containing artificial silk should be manufactured at humidities lower than those ordinarily maintained in mills handling only natural fibres. It is further pointed out that the effect of the increasing speeds employed in manufacture should be studied. As the rate of work done on the fibres is increased the heat added to them is increased. This heat is carried away by the air in contact with the fibres, so that its temperature is increased and its relative humidity is lowered. Through this effect the regain of the fibres corresponds to a lower relative humidity than that of the atmosphere of the room. In some cases the discrepancy between the normal regain and that actually obtained in practice has necessitated a relative humidity in the room 5% higher than that corresponding to normal regain practice."—Textile Inst. J. 19: A65.

151. URQUHART, A. R. The moisture relations of cotton. The absorption of water by cotton mercerised with and without tension. Textile Inst. J. 18: T55-T72. Feb. 1927. 73.9 T31

"In previous work with loose cotton it was found that the curves showing the relation between the hygroscopicity of mercerised cotton and the concentration of the mercerising solution were of similar form to those representing the swelling of cotton hairs in solutions of sodium hydroxide. This result has been confirmed in the present research on yarns mercerised with and without tension, the differences observed being explainable in terms of the effects of tension. It is also found that the changes in the absorptive capacity of cotton brought about by mercerisation are very similar for all the varieties of cotton examined. The applied tension acts in opposition to the swelling forces, so that the absorptive capacity of cotton mercerised with tension is considerably less than that of cotton mercerised loose. Some figures for technically mercerised materials are given for comparison with those of the laboratory preparations."—Author's summary.

152. BURLET, E. ESSAIS pour la mise au point du "Conditionnement" par la "Méthode rationnelle ou directe." Rev. Textile 26: 1699-1709; 27: 11-15. 1928-29.

"Samples of textile materials were cut into two portions. One portion of each sample was soaked in water and the other heated to absolute dryness. Both were conditioned at 18° and 65% humidity for several days, the regain being determined at intervals. The results are tabulated and curves constructed for samples of artificial silk, cotton, and wool. In each case, after about 24 hours, the regain attains a constant value but for the two halves of a given sample, treated as described, the constant values are not identical. The part which was heated to dryness always has the lower regain value. After allowing for a loss of hygroscopicity produced by drying, it is shown that between the constant weights at 18° and 65% humidity of the portion previously wetted and an equal portion of material previously dried, the maximum variation is about 2 1/2% for artificial silk (viscose), 2% for wool, and 1 3/4% for cotton. The author discusses the importance of this variation in the conditioning of textiles and suggests that the mean normal weight of a sample should be taken as the sum of the constant weights of its two halves at the standard temperature and humidity, one half being previously subject for several hours to air at 85-88% and the other to air at 35-40% humidity. (Normal 65%.)"—Textile Inst. J. 20: A273.

153. FAUST, O. Die quellbarkeit von hydratcellulose. Cellulosechemie 9(7/8): 74-75. July 8, 1928. 309.8 C33

"Changes in the length of artificial silk fibers on immersion in water and in NaOH solns. show that the degree of swelling decreases with increasing temp., the difference being greater the higher the concn. of NaOH. The degree of swelling, as detd. by length measurements, is lower in H_2SO_4 solns. than in water."—Chem. Abs. 23: 5573.

154. KARRER, P., and SCHUBERT, P. Über das grenzflächenpotential von textilfasern in wasser. Helvetica Chim. Acta. 11: 221-229. 1928. 385 H36

"The potentials at the surface of contact of a no. of textile fibers in water have been detd. The exptl. method and data are given. Silk appears to be the most nearly electrically compensated fiber. Wool assumes in water a strongly negative character. Cu, Chardonnet and viscose rayons are only weakly negative, while cellulose acetate is strongly so. The decrease in negative character going from native to mercerized cotton to regenerated cellulose is striking. All yarns treated with pyridine assume a positive charge. There appears no relation between the contact potential and dyeing properties, enzyme resistance or the acid or salt content of the coagulation bath of the viscose rayon."—Chem. Abs. 22: 2062.

155. MURPHY, E. J., and WALKER, A. C. Electrical conduction in textiles. I. The dependence of the resistivity of cotton, silk and wool on relative humidity and moisture content. J. Phys. Chem. 32: 1761-1786. 1928. 381 J822

"A study of the resistance of cotton, silk and wool samples with relative humidity and moisture content. The conductance of a cotton thread is equal to the sum of the conductances of the fibers of which it is composed; the rate of change of insulation resistance with relative humidity is independent of the form of the sample and of its electrolyte content. Equations are given for calcg. the resistance of a cotton sample for any moisture content. The rate of change of resistivity with moisture content is much greater for silk and wool than for cotton, and for a given moisture content the resistivity of silk or wool is greater than that of cotton."—Chem. Abs. 23: 1273.

156. BARRITT, N. W. Some properties of the cell-wall of cotton hairs. Ann. Appl. Biol. 16: 438-443. 1929. 442.8 An72

"The cell-wall of the living cotton-hair is under tension and its diameter is unaffected by osmotic pressure or the death of the cell. Increase of diameter of the uncollapsed hair by swelling in caustic soda varies inversely as the diameter of the hair in the case of fine cottons, and does not occur with coarse cottons. The diameter of the uncollapsed cotton-hair varies inversely as the intrinsic strength of the collapsed hair."—Author's summary.

157. GUYE, C. E., and SAINI, H. Contribution expérimentale à l'étude énergétique des phénomènes d'imbibition. Helvetica Phys. Acta. 2: 445-491. 1929.

An experimental study of the comparative conditions of propagation of a liquid (kerosene, "huile de vaseline", water) in a porous strip (blotting paper) in either a vertical or a horizontal position. The results are compared with equations which represent approximately the theoretical conditions, and are found to agree for only very small distances of propagation by imbibition.

158. MEUNIER, L., and GUYOT, R. Sur les propriétés hydrophiles des fibres cellulosiques sthénosées. Paris Acad. des Sci. Compt. Rend. 188: 506-508. 1929. 505 P21

"The optimum conditions for viscose strengthening are 12 hour soaking in an aq. HCHO soln. (concn. greater than 5%), with a pH between 1.6 and 1.2, preferably obtained from H_3PO_4. By an increasing degree of strengthening, the % swelling in pure H_2O, the elongation at the rupture point, the absorption of substantive dyes or tannins, and the hydrometric water decrease, while the resistance toward alkalies and the tensile strength increases. The mechanism of strengthening is regarded as follows: (1) The influence of acids causes a partial transformation of cellulose into hydrocellulose, whereby the number of OH groups is increased. (2) Evaporation concentrates the acid to a point where it becomes an active catalyst for the formation of methylenic derivs. (3) Two OH groups belonging to different chains react with HCHO. (4) The action of HCHO does not remain confined to the surface but penetrates deeply."—Chem. Abs. 23: 3342.

159. MEUNIER, L., and GUYOT, R. Sur les propriétés hygroscopiques des fibres artificielles dérivant de la viscose. Chim. & Indus. Paris (Spec. No.): 585-591. Feb. 1929. 383 C42

"Using viscose from a given lot of the com. article, M. and G. studied: (1) the isothermal absorption and desorption of H_2O in normally manufd. viscose; (2) the isothermal adsorption and desorption of H_2O in viscose which had been previously heated 15 hr. at 105°, and the effects of the time of heating at 105° on the hygrometric properties, swelling, dyeing by direct dyes, tensile strength and elasticity; (3) the desorption curves of viscose at different temps.; (4) the modifications in hygrometric properties produced by the more or less complete blocking of the alc. functions by treatment with CH_2O, and the relation between the hygrometric properties and the swelling of the fibers after treatment with CH_2O. Conclusions: the isothermal desorption equil. corresponds to a higher H_2O content than the absorption equil. The H_2O content, detd. at 105° by absorption, is higher than the H_2O content by absorption detd. in dry vacuum, and the same is true for desorption, and in the latter case the difference is greater than for absorption. The various curves show the characteristic S-shape, indicating that at a given point there is a certain modification in the activity of fixation of H_2O, on the one hand, and of its elimination on the other. On prolonged heating there is a slight decrease in hygroscopicity and a much greater decrease in swelling properties and in the capacity to fix substantive dyes, but the mech. properties are not appreciably affected. The desorption curves detd. at 0°, 11°, 25°, and 37° showed that for a given hygrometric state the H_2O content decreases with the temp. of the expt. With viscose which has been treated with CH_2O, the difference between absorption and desorption (for a given degree of swelling) decreases with the degree of swelling, particularly for low values of the latter, indicating that, on the whole, the hygroscopicity of the fiber is a function of the no. of free alc. radicals remaining in the mol. The results are in general agreement with those of Urquhart and Williams (C.A. 18, 1754,2067; 19, 898,1631, 2749)"—Chem. Abs. 23: 4076.

160. NAKASHIMA, T. [Viscose. XXVI. Swelling of cellulose in sodium hydroxide solutions.] (In Japanese.) Cellulose Indus. 5: 199-202. 1929. J309.8 C332

"Samples of a ground and finely sieved cotton paper were treated in graduated tubes with NaOH solns. of different concns., and were subsequently centrifuged under standard conditions. The resulting vols. of the cellulose samples were taken as a measure of the swelling during the treatment. A max. swelling occurs in 10% soln., followed by a decrease and then by an increase in 18-35% solns. The value for 35% concn. is greater than that for 10%. Comparison of the results with those obtained by Katz (C.A. 19, 2273) in the X-ray spectrographic examns. of the swelling effects of similar NaOH solns. indicates that the swelling is due to mercerization as well as to other causes. If cellulose previously mercerized with 18% NaOH is used in expts. similar to those described, the increase in swelling for 18-35% solns. is no longer found. Hence, the swelling observed with unmercerized material depends on this mercerizing action."—Chem. Abs. 24: 2288.

161. NEALE, S. M. The swelling of cellulose, and its affinity relations with aqueous solutions. Part I. Experiments on the behaviour of cotton cellulose and regenerated cellulose in sodium hydroxide solution, and their theoretical interpretation. Textile Inst. J. 20: T373-T400. Dec. 1929. 73.9 T31

"A study is made of the partly irreversible swelling of sheets of regenerated cellulose (I) in NaOH solns. of different concns.; the NaOH and H_2O taken up by I and the heat of reaction of various types of cellulose (II) with NaOH soln. are detd. Dimensional changes of I when changed from one soln. to another confirm the theory that the swelling is due to osmotic forces. II is visualized as a very weak monobasic acid which forms a Na salt to an extent increasing with the concn. of NaOH. Excess NaOH diffuses into the mechanically separable phases of II in amount detd. by Donnan's thermodynamic equation of membrane equil. The resulting unequal distribution of ions causes an osmosis of water that distends II until the osmotic pressure is balanced by cohesive forces of the gel. Replacement of the NaOH soln. with water hydrolyzes the Na salt of II, lowers osmotic pressure, and II is recovered unchanged chemically but permanently distorted if the osmotic pressure has been sufficiently high. The theory accounts for the swelling of II, which is greatest in moderate concn. of alkali and for the fact that the swelling is greater and the optimum concn. lower at lower temp. If the exptl. values of absorption of water from alkali soln. be taken as a basis, the theory predicts the corresponding alkali sorptions over the concn. range examd. (0.5-23.0 M). The curve of the heat of reaction of I with NaOH agrees with the salt formation. Less heat is developed with purified cotton except in concns. that produce much swelling. Mercerized cotton occupies an intermediate position. These differences between the forms of II are explained in terms of an "accessibility factor" which is near unity for I and which with cotton increases with swelling."—Chem. Abs. 24: 3110.

162. PORRVIK, G. Hydration, paper formation and strength. Pulp and Paper Mag. Canada 28: 133-136, 149-150. 1929. 302.8 P96

"The degree of freeness of pulp is detd. by the water which the pulp holds, which is of 3 kinds: outer capillary water (remaining in the interstices between the fibers), inner capillary water (in the lumen of the fibers) and water in the fiber walls. The holding together of the fibers in paper is not in any essential degree a felting process, but a phenomenon of colloidal chem. 'sizing,' or binding of the fibers to one another. The significance of beating is that, through mech. working, the degree of swelling of the fiber walls is increased, whereby the fibrous tissues are rendered more capable of 'sizing' and more plastic. The fibrous walls consist of several sheaths; when the outer sheath (the 'sizing' sheath) swells, the power of the 'sizing' particles is increased, and thereby the strength. When the fundamental substance swells, the fibers are split into fibrils, and a paper of more delicate texture is obtained. Beating is not an uninterrupted process, but falls into 3 stages, during which essentially different phenomena occur. In the 1st stage, extending to 30° Schopper-Riegler, the inner capillaries are filled and a portion of the sub-microscopic 'sizing' substance in the fiber walls is filled with water with simultaneous expulsion of air. In addn., a colloidal swelling of the fiber walls takes place. This results in an increase in the vol. of the fibers in their moist state and produces a great increase in their plasticity and 'sizing' power. In consequence, these fibers are much more capable of union and sticking together after pressing. In this stage the outer capillaries contract, contributing to the making of a thicker paper with lower absorbency. The most important effect is the fact that the surfaces of the fibers that touch one another increase. In the 2nd stage, extending from 30° to about 80° Schopper-Riegler, the swelling caused by kneading of the fibers increases, which especially contributes to the plasticity of the fibers and the 'sizing' power of the outer layer. In the 3rd stage, above 80° Schopper-Riegler, there is an active splitting into fibrils, whereby the inner capillaries cease to exist. Between the fibers a new capillary surface is formed, very short, and consequently resistant to pressure."—Chem. Abs. 23: 5586.

163. SPEAKMAN, J. B. Adsorption of water by wool. Nature [London] 124: 411-412. 1929. 472 N21

"S. has shown in previous papers that when wool fibers are held stretched in water the fibrillae within the cells undergo plastic flow and take a permanent set. The present expts. seem to provide an answer to some of the questions raised by King (Trans. Faraday Soc. 25, 451 (1929). The adsorption of H_2O by wool fibers stretched 30% of their length under H_2O (to acquire max. plastic flow without rupture of the fibrillae) is compared with the adsorption of H_2O by untreated wool fibers. Each sample was taken from abs. dryness up to satn. in stages, and then in the reverse order to dryness. The stretched samples adsorbed more H_2O in every case than the untreated ones. It thus appears that plastic flow in the fibrillar structure alone will increase the affinity of wool for H_2O."—Chem. Abs. 24: 1222.

164. TURNER, A. J. Further tests on the effect of temperature and humidity on cotton spinning. Indian Cent. Cotton Com., Bombay, Technol. Lab. Bul. 19[i.e. Technol. Bul. Ser. A, No. 10], 17 p. 1929. 72.9 In2332A

"Two cottons, Nandyal 14(Northerns) and Memphis (American) were spun and the medium dry, normal, and monsoon conditions noted in a previous bulletin, and also under 'hot-dry' conditions similar to those often experienced in up-country mills, viz., a temperature of about 100 F. and a relative humidity of about 25%. The results confirm and extend those of the previous tests. By reducing the relative humidity to below 30%, a stage is reached when drawing cannot be carried out satisfactorily; moreover, yarn breakages on the ring frame become more numerous at this low humidity, the effect being especially pronounced in the higher counts, which also have lower strength when spun under very dry conditions. It is therefore concluded that although for Indian cottons spun into counts not higher than 40's it is sufficient to keep the relative humidity rather above 30%, yet if higher counts were to be spun, bad spinning troubles would be still more in evidence, and it would be desirable to work at a higher relative humidity, say at least 40%, or even higher, for very fine counts. The yarns spun under various conditions of temperature and humidity are very similar in evenness and neppiness, but differ widely in appearance, for the yarns spun under very hot dry conditions are very cozy indeed, full of snarls and exceedingly crimpy; those spun under medium dry conditions suffer from the same defects to a lesser extent, whereas those spun under normal and monsoon conditions are free from them. All these differences between the yarns almost entirely disappear when the yarns are conditioned by immersion in water."—Textile Inst. J. 20: A532.

165. BARRITT, N. W. The determination of fineness of Egyptian cotton and its relation to quality. Empire Cotton Growing Rev. 7: 19-29. 1930. 72.8 Em7

"From the botanical standpoint hair weight per cm. is a measure of the nutrition of the hairs and an indication of the neppiness or waste likely to be produced in spinning rather than a measure of fineness. Fineness is more suitably determined by diameter measurements...Two measurements are made on every hair, one at the flat portion of the convolution and the other at the region of the twist, or 'edge-on' position. The mean of the two approximates more or less closely to the mercerized diameter...."—Textile Inst. J. 21: A257.

166. CHILIKIN, M. M. [The heat of adsorption of sodium hydroxide by the cellulose and the heat of mercerization.] Zhur. Prikl. Khim. 3: 221-230. 1930.

"Egyptian cotton contg. 5.80% moisture liberates 704.2 cal. per mol. of $C_6H_{10}O_5$ when it is wetted with water, while dry cotton liberates 1319.2 cal. and dry mercerized cotton 2351.6 cal. When wetted with 50% EtOH soln. dry

166. CHILIKIN, M. M. (Cont.)
cotton liberates 1307.54 cal. and dry mercerized cotton 2206.45 cal. The heat of adsorption of NaOH is greater if cotton is purified by boiling in water and not in EtOH. Mercerization is not accompanied by evolution of any appreciable amt. of heat. The heat of adsorption also depends on the colloidal state of the fibers. The amt. of heat given off gradually increases as the NaOH concn. in the soln. is increased irrespective of the quantity of NaOH adsorbed by the cellulose. In this respect mercerized and raw cellulose behave alike. The change in NaOH concn. on the cellulose has no influence on the amt. of heat evolved in wetting such cellulose with the NaOH solns. of various strengths. The heat of mercerization is greater when raw cotton is employed and not the cotton which was purified by boiling in water. If cotton is wetted with NaOH soln. weaker than 35% Bé. the evolution of heat begins within the first few min. but when stronger NaOH solns. are used the cotton is wetted only with difficulty and considerable time is required before all of the heat is given off. This shows that the 35° Bé. soln. is the limiting concn. for mercerization of the cellulose in practice. Thermal data do not indicate formation of $2C_6H_{10}O_5$.NaOH. The heating effect is due to adsorption of NaOH by the cellulose and not to a chem. reaction."—Chem. Abs. 24: 3899.

167. COLLINS, G. E. The swelling of cotton hairs in water and in air at various relative humidities. Textile Inst. J. 21: T311-T315. July 1930. 73.9 T31
"A study of the desorption and absorption of cotton hairs shows a close parallelism between the extent of the dimensional changes and the amt. of the absorption, at least over the temp. range of 20-100° studied. The changes in area and in length of cotton hairs for relative humidities ranging from 100% (water) to 0% (obtained by drying with P_2O_5) and again to 100%, relative to dimensions at 0% relative humidity are tabulated. A max. av. swelling of 48.6% was obtained for cotton hairs at 100% relative humidity. The temp. of the H_2O has little effect on the amt. of swelling within the limits of 20-120° studied."—Chem. Abs. 25: 418.

168. FRICKE, R., and LUKE, J. Quellungsarbeit und quellungswärme. Ztschr. f. Elektrochem. 36: 309-321. 1930. 384 Z342
"Water vapor pressure measurements were made on gels of casein, agar and keratin (human hair); the first two showed marked hysteresis. The differential work of swelling was calcd. from the relative vapor pressures, and the differential heat of swelling from their temp. coeff. The heat of sweiling is generally larger than the work, but the curves are approx. parallel only over a restricted range of concn."—Chem. Abs. 24: 4202.

169. PIDGEON, L. M., and MAASS, O. The adsorption of water by wood. Amer. Chem. Soc. J. 52: 1053-1069. Mar. 1930. 381 Am33J
"The adsorption of H_2O by certain coniferous woods and by cotton cellulose has been measured by a new method. The complete range of vapor pressures has been covered and adsorption isothermals have been produced for temps. between 12° and 42°. .... Adsorption isosteres are represented by log $a/c = B + AT$ for adsorptions representing more than 2%. The form of the adsorption curve shows that wood may be classed as a swelling gel. The first part of the curve is due to surface adsorption, the rest to the filling up of submicroscopic spaces. Cotton cellulose is fundamentally different from the cellulose in wood; this is brought out by the adsorption curves not coinciding over any portion of their length. A hysteresis effect between gain and loss of H_2O has been found, except at low vapor pressures, but the higher value attained by the loss of H_2O is considered to represent the true equil. value at any vapor pressure. By an application of modern gel theory a theoretical explanation of the observed facts is offered."—Chem. Abs. 24: 1974.

170. PIDGEON, L. M., and MAASS, O. The penetration of water vapor into wood. Canad. J. Res. 2: 318-326. 1930. 330.9 C16C
"The rate of diffusion of water vapor through wood was studied through a comparison of the time taken for samples of various thicknesses to become satd. This process is, in a sense, the converse of natural drying, and for comparative purposes is more amenable to careful control of pressure and temp. Continuous measurements of the amt. of adsorption were carried out by the use of a quartz spring balance completely enclosed in the app. at a const. vapor pressure. Comparative numerical values were obtained of the rate of diffusion of water vapor through spruce (Picea canadensis) and pine (Pinus banksiana) in various directions, through heartwood and sapwood, and through samples of different lengths. The results are considered as evidence that the movement of water through wood, at concns. below the satn. pt., takes place as vapor diffusion through the spaces of the wood structure due to the pressure gradient consequent on the difference of moisture content."—Chem. Abs. 24: 4155.

171. OGURI, S., and NARA, M. Hygroscopic moisture of cellulose. (Abs.) Soc. Chem. Indus. [Japan] J. (sup. binding) 33: 267B-270B. 1930. J385 J82
"Standard cotton cellulose (Hibbert, et al., C. A. 17, 2781), bamboo cellulose made by chlorination of ground bamboo and purified by 17.5% NaOH soln., wood cellulose extd. from chem. wood pulp as in detn. of a-cellulose, and nitrocellulose of 10.78% N obtained by nitrating standard cotton cellulose were placed in a closed vessel satd. with H_2O vapor at const. temp., and equil. moisture was detd. Equil. is not independent of temp., an increase in temp. being accompanied by diminution of H_2O content. Equil. depends upon the origin of cellulose, and with standard cotton cellulose is 16.8 and 15.2% (dry basis) at 20 and 30°, resp., higher than those with bamboo and wood celluloses. This difference may be due to differences in structure. The OH group in cellulose has a special attraction for H_2O, as is shown by the fact that the equil. H_2O of the original cotton cellulose is higher than that of nitrocellulose. Cellulose requires long exposure to satd. vapor to attain equil. The curves of velocity of satn. of moisture closely resemble those of adsorption. There is probably adsorption moisture, combined moisture and absorption moisture in cellulose."—Chem. Abs. 24: 5479.

172. NEALE, S. M. The swelling of cellulose, and its affinity relations with aqueous solutions. Part II. Acidic properties of regenerated cellulose illustrated by the absorption of sodium hydroxide and water from dilute solutions, and the consequent swelling. Textile Inst. J. 21: T225-T230. May 1930. 73.9 T31
"The ionization const. of cellulose was detd. by the method previously described but observations were confined to dil. solns. of NaOH (below 0.5 molal) on which precise thermodynamic measurements have already been made by other workers. The quant. relations previously discussed are not seriously affected by the adoption of the value thus obtained, viz. 1.84×10^{-14} at 25° in place of the rather arbitrarily chosen figure 2.0×10^{-14}. The swelling-concn. curve for cellulose and dil. NaOH was established by observing the increase in length of strips of sheet cellulose cut so that the length lay in the direction of max. extension when immersed in alk.soln. of increasing concns. The shape of the curve obtained agrees with the theoretical considerations of the former paper."—Chem. Abs. 24: 6003.

173. SPEAKMAN, J. B. The adsorption of water by wool. Soc. Chem. Indus. J. Trans. and Commun. 49: 209T-213T. 1930. 382 M31
"The adsorptive and desorptive properties of purified wool fibers were studied over a wide range of atm. humidities. Marked hysteresis existed between the 2 processes. The hygroscopic properties of wool were slightly reduced by diazotizing or treating wool with formaldehyde, proving that free amino acid groups exert an insignificant influence in water adsorption. A comparison of the changes produced in the elastic properties and size characteristics of wool by water adsorption suggests that the fiber is composed of long-chain protein mols. arranged about the long axis of the fiber. Water adsorption is dependent upon the polypeptide groups in these mols."—Chem. Abs. 3376: 24.

174. STAMM, A. J. An electrical conductivity method for determining the moisture content of wood. Indus. and Engin. Chem., Analyt. Ed. 2: 240-244. 1930. 381 J825
"The elec. resistance of wood increases over a millionfold from a 20-35% moisture content, which corresponds to a satn. of the fibers, to the oven-dried condition. A linear relationship exists between the logarithm of the sp. elec. resistance and the moisture content. In this paper a simple, compact and portable app. is described for measuring the elec. cond. and thereby the av. moisture content of wood. Various interesting results of measurements are discussed."—Chem. Abs. 24: 4240.

175. HALLER, W. Eine methode zur messung der benetzungs spannung und einige ergebnisse. Kolloid Ztschr. 54: 7-13. 1931. 384 Z315

"The forward and reverse displacement velocities of a meniscus are measured when moving to equil. in a horizontal capillary; the liquid pressure is varied to make a series of detns. Extrapolation to 0 velocity gives the difference in liquid levels which is directly related to the wetting tension by the equation $\beta = \alpha - 2(h_r - h_v)\, d/r$ where β is the wetting tension, h_r is the height of capillary rise on the inward (reversed) movement or the height with complete wetting, h_v is the height on the outward movement or with incomplete wetting, α is the surface tension, d the d. of the liquid, and r the radius of the capillary. Wetting tensions on glass at 20° were detd. for the following liquids and are expressed dynes/cm.: iso-amyl alc. 22.7, heptyl acetate 23.9, petroleum 24.8, hexanol 25.6, benzyl alc. 37.0, lactic acid 38.5, aniline 39.7, acetophenone 40.6, glycol 43.9, water 50.5, glycerol 62.6. A hysteresis phenomenon appears in the measurements which is quite singular. Acetophenone leaves a very unstable film on the glass. Liquids like water, glycol, glycerol, and lactic acid leave stable films and on repeat measurements the curve shows the characteristics of a completely wetting liquid ($h_r - h_v = 0$). By coating the inner walls of the capillary with a film, wetting tensions on ceresin, nitrocellulose, gelatin, and acetylcellulose can be detd. Acetylcellulose films show a marked aging effect. Liquid mixts. and solns., especially of capillary-active substances, behave differently from pure liquids. Butanol in water lowers the surface tension but not the wetting tension on glass. When the surface tension is less than 51 dynes/cm. the soln. wets glass completely. The effect of a solute on the wetting tension depends on the nature of the adsorption film formed. With unstable films, there is no change in the wetting tension, but the wetting velocity is affected; with metastable films, there is a decrease in the wetting tension; with stable films, there is an increase in the wetting tension. Capillary-active substances with no effect on the surface tension of the soln. may cause a large effect on the wetting tension. Sugar solns. with 0.05% sugar concn. raise the wetting tension and give films that display vivid interference colors."—Chem. Abs. 25: 1137.

176. HESS, K., and AKIM, L. Faserfeinbau und quellung bei cellulose. Cellulosechemie 12: 95-103. 1931. 309.8 C33

"Microscopical observations were made of swollen fibers (cotton and ramie) after treatment with benzene-alk. mixt. (1:1), 2% NaOH, and ClO_2-Na_2SO_3 and then dyeing. Photographs obtained with direct and polarised light showed differences which the authors attributed to alternate layers of chemically different substances."—Chem. Abs. 25: 5759.

177. KATZ, J. R., and DERKSEN, J. C. Zur erklärung der quellkraft der rhodanide und über verbindungen von cellulose und neutralsalzen. Rec. des Trav. Chim. des Pays-Bas. 50: 149-152. 1931. 385 R24

"The swelling of stretched ramie fibers by concd. LiSCN solns. has been investigated by the X-ray method. When the solns. more concd. than 3LiSCN:1H_2O are used, the fibers show an altogether new Röntgen spectrum for cellulose. With solns. of lower concns., the salt appears to be adsorbed on the surface of the micelle, without any change in the structure of the latter. With higher concns., presumably addn. products are formed on the O atoms of the cellulose, and these compds. are responsible for the new X-ray patterns. Cellulose can be mercerized by solns. of salts of high soly., the degree of mercerization increasing with the salt concn. and the length of the heating."—Chem. Abs. 25: 2846.

178. KRESS, O., and BIALKOWSKY, H. Some chemical and physical observations on hydration. Paper Trade J. 93(20): 35-44. Nov. 12, 1931. 302.8 P196

"A description of work undertaken on bleached Mitscherlich sulfite pulp with a view to detg. the phys. and chem. effects produced by beating. There is practically no change in α-cellulose content, Cu no. and soda soly.; the changes observed in cuprammonium viscosity and in the Schwalbe hydrolysis no. are attributed, not to chem. changes in the pulp, but to the fact that the fiber is more reactive because of mech. disintegration. Exptl. evidence shows that the so-called colloidal characteristics of beaten stock are reversible, and also that water does not combine chemically with the fibers during so-called "hydration." When stock is beaten in a liquid having an OH or potential OH group and a high dielec. const., the pulp swells (as measured by the dilatometer) and hydrates; in liquids of low dielec. const. there is no swelling or hydration. No appreciable difference was observed in the rate of adsorption of acid, alkali, rosin size or dyes by pulps beaten in varying degrees; the difference in shade of sheets beaten to different extents but prepd. with the same amts. of dye is due to phys. changes in the sheet which produce increased color effect."—Chem. Abs. 26: 594.

179. NEALE, S. M. The action of caustic soda on cellulose. Soc. Chem. Indus. J., Trans. and Commun. 50: 177T-182T. 1931. 382 M31

"Certain of the cellulose OH groups are weakly acid, and form a completely hydrolyzable Na salt. The swelling increases to a max. because of the osmotic water attraction of the gel phase. As the alkali concn. increases, the swelling falls on account of the increasing osmotic attraction of the water phase. The activities of cellulose when "activated" by alkali and degraded by oxidizers are compared. The increasing "activation" of cellulose, when pretreated with increasing concns. of alkali, toward various reagents is studied and the data are presented. The effects of mercerization, of mercerization followed by stretching, and of mercerization during stretching on cotton yarns are detd. The activation is lessened by restraint of swelling in alkali, drying at high temp. or scouring with boiling dil. alkali following swelling."—Chem. Abs. 25: 5981.

180. NEALE, S. M. The swelling of cellulose and its affinity relations with aqueous solutions. Part III. The preferential absorption of sodium hydroxide from dilute solution as a characteristic property of cellulose, and an indication of previous mercerization or other swelling treatment. Textile Inst. J. 22: T320-T338. June 1931. 73.9 T31

"This paper described the use of the preferential absorption of NaOH, calcd. from the change in concn. of the liquid phase on the assumption of a const. mass of water therein, as an approx. measure of the activation of the cellulose resulting from treatment with reagents causing swelling. The method of detg. this quantity is: 30cc. 0.5 N NaOH is added to a wt. of the sample corresponding to 2 g. of dry cellulose. The whole is shaken, or allowed to stand with occasional shaking, for not less than 2 hrs., preferably in a thermostat at a fixed temp. Ten cc. of the clear soln. is then titrated with 0.1 N acid, and the alkali absorbed is calcd. The effect of alkali concn. on the preferential absorption by various types of cellulose from solns. of NaOH ranging in conc. from 0.25 to 5 N was studied."—Chem. Abs. 25: 5295.

181. OGURI, S., and TERUI, S. Hygroscopic moisture of cellulose. II. (Abs.) Soc. Chem. Indus. [Japan] J., (Sup. binding) 34: 182B-186B. June 1931. J385 J82

Also in Tokyo. Waseda Univ. Faculty of Sci. and Engin. Mem. No. 11, p. 96-100. 1934.

"The sorption of water by standard cellulose was measured by means of a spring balance and sorption isotherms were obtained for temps. between 12° and 28°. When the various isotherms are plotted against relative humidity the curves converge into one."—Chem. Abs. 25: 5285.

182. OGURI, S., and TERUI, S. Hygroscopic moisture of cellulose. III. (Abs.) Soc. Chem. Indus. [Japan] J., (Sup. binding) 34: 229B-233B. July 1931. J385 J82

"A comparison of the isohygrometric curves for viscose and mercerized, cotton and standard celluloses placed the moisture contents (50% relative humidity) at 9, 8, 5.8 and 5.5%, resp. It was assumed that these curves could be represented by Langmuir's equation, $y = x/(a + bx - cx^2)$, where y = % moisture of the sample at equil. and x = the relative humidity. The consts. were: standard cellulose, a = 2.4137, b = 0.2355, c = 0.0020; cotton cellulose; a = 1.332, b = 0.2560, c = 0.00215; mercerized cellulose; a = 1.9802, b = 0.1433; c = 0.001205. A detn. of the rates of moisture adsorption and desorption by the standard cellulose at 20° yielded typical sorption curves, 88% of the total change occurring in 20 min."—Chem. Abs. 26: 590.

183. SAITO, G. The swelling of cellulose in alkali. (Report 1 and 2) (Abs.) Soc. Chem. Indus. [Japan] J., (Sup. binding): 34: 437B-444B. Nov. 1931. J385 J82

"When immersed in water the cross-sectional area of viscose fibers increases very rapidly, independent of the temp., to a const. value after about 1 hr. When immersed in alk. solns. of various concns. the cross-sectional area increases rapidly with increasing alk. concn. to 97 g./l., above which it decreases, the rate of decrease becoming less as the concn. of alkali increases. The comparatively small change in length under similar conditions attains

183. SAITO, G. (Cont.)
2 min. and 1 max. point. The first min. point is movable, however, shifting to a higher concn. of alkali as the strength of the fiber increases and the elongation decreases. The second min. point appears at an alk. concn. of about 220 g./l. Near the first min. point of change in length the cross section has a min. roundness and near the max. swelling point at an alk. concn. of 97 g./l. the cross section has a max. roundness."—Chem. Abs. 26: 2587.

184. WANT, D. VAN DER. Het systeem cellulose-natrium-hydroxyde-water. Chem. Weekbl. 28: 507-510. 1931. 385 C42

"A new method was developed to study the system: cellulose-NaOH-H_2O. An inert material like NaCl or NaI is introduced into the system. The solid and liquid phases are then sepd. and the total quantity of the inactive material in the solid phase is detd. and also the percentage in the liquid phase. The amt. of free liquid in the solid phase can then be calcd. With the aid of the NaOH concn. in the liquid phase, the free NaOH in the solid phase can be calcd. and this deducted from the total NaOH gives the combined NaOH. Preliminary conclusions: Cellulose combines with NaOH and with H_2O. The quantity of combined NaOH increases and the quantity of combined H_2O decreases with increasing NaOH concn. The combination is solely by absorption."—Chem. Abs. 26: 357.

185. CHAMPETIER, G. Fixation de l'eau par la cellulose. [Paris] Acad. des Sci. Compt. Rend. 195: 280-282. July 18, 1932. 505 P21

"Water is fixed by cellulose in strict stoichiometric proportions and indicates the existences of 2 types of hydration in accordance with the following formulas: $2C_6H_{10}O_5 \cdot H_2O$ for ordinary cellulose and $C_6H_{10}O_5 \cdot H_2O$ for mercerized cellulose."—Chem. Abs. 26: 5415.

186. CHAMPETIER, G. Sur une méthode de détermination de la composition des composés d'addition de la cellulose. [Paris] Acad. des Sci. Compt. Rend. 195: 499-501. Aug. 29, 1932. 505 P21

"The method consists in studying the system cellulose-H_2O-substance A by analyzing series of samples contg. a decreasing quantify of mother liquor. The samples are taken in the course of a progressive drying of the cellulosic compd. impregnated with mother liquor. The variation in the quantity of A in the successive samples as a function of the H_2O in them is a straight line. This line passes through a point which would correspond to the analysis of a sample contg. no mother liquor. The coordinates of this point, which cannot be detd. experimentally, fix the compn. of the compd. if it exists. In order to det. this point it is necessary to consider all the lines related to the different concns. of solns. of A. In the case of a definite compd. a series of lines forms a bundle meeting in a common point, the coördinates of which fix the compn. of the compd. This method has been applied to the systems: cellulose-H_2O-NaOH; cellulose-H_2O-$Na_2S_2O_3$; cellulose-H_2O-C_5H_5N; cellulose-H_2O-HCO_2H; and cellulose-H_2O-AcOH. The method differs from that of Schwarzkopf (C.A. 25, 5759; preceding abstr.) in that it is not necessary to formulate a hypothesis in regard to the fixation or non-fixation of a substance to cellulose, or to add a 4th constituent to the system to det. the quantity of H_2O of hydration contained in a ternary compd."—Chem. Abs. 26: 6121.

187. NEWSOME, P. T., and SHEPPARD, S. E. The sorption of water vapor by cellulose and its derivatives. Part III. The heat of adsorption of water vapor by cellulose acetates. J. Phys. Chem. 36: 930-938. 1932. 381 J822

"The moisture adsorption isotherms of a cellulose acetate sheet were detd. at 30°, 40° and 50° with a SiO_2 spring balance. The moisture adsorption decreases with increase in temp. at all humidities. The heats of adsorption calcd. from the isotherms for the ranges 30° to 40° and 40° to 50° decreased with increasing moisture content of the cellulose acetate. The heat of adsorption of water vapor by a cellulose acetate sheet was detd. calorimetrically at 25° and compared with the heats of adsorption calcd. from the isotherms at 20° and 30°. The latter were considerably higher than the former. The heat of adsorption of water vapor by cellulose triacetate (44.8% acetyl) was less than that by a cellulose acetate of 38% acetyl."—Chem. Abs. 26: 2635.

188. OGURI, S. Hygroscopic moisture of cellulose. The fifth report. On drying method of celluloses (Abs.) Soc. Chem. Indus. [Japan] J. (Sup. binding) 35: 232B-234B. 1932. J385 J82

Also in Tokyo. Waseda Univ. Faculty. Sci. and Engin. Mem. No. 11, p. 111-114. 1934.

"Drying various types of cellulose by (1) heating at 105°, (2) in vacuo over P_2O_5 and (3) in vacuo showed (2) to be most effective and (1) next, but the effectiveness varied with different samples."—Chem. Abs. 26: 4946.

189. OGURI, S. The sixth report. On hygroscopic moistures of raw cotton and tissue paper. (Abs.) Soc. Chem. Indus. [Japan] J. (Sup. binding) 35: 235B-239B. 1932. J385 J82

"In general cellulose with a low hygroscopicity expels moisture by the vacuum method as well as by the heating method. The hygroscopicities of raw cotton and tissue paper prepd. from cotton are approx. equal, but greater than that of standard cotton cellulose (cf. C. A. 25, 5285)."—Chem. Abs. 26: 4946.

190. OGURI, S. The seventh report. On hygroscopic moisture of bamboo cellulose. (Abs.) Soc. Chem. Indus. [Japan] J. (Sup. binding) 35: 239B-244B. 1932. J385 J82

"Bamboo cellulose is more hygroscopic than cotton cellulose."—Chem. Abs. 26: 4946.

Adsorption isotherms and isohygrometric curves given for bamboo celluloses and compared with cotton celluloses.

191. OGURI, S. Hygroscopic moisture of cellulose. VIII. (Abs.) Soc. Chem. Indus. [Japan] J. (Sup. binding) 35: 279B-282B. 1932. J385 J82

"Regenerated cellulose adsorbs water vapor more readily than natural or mercerized cellulose. Although the origin of cellulose may be different, regenerated cellulose prepd. by the same process adsorbs an equal amt. of water vapor under similar conditions. Although the process of regeneration is varied the hygroscopic properties of regenerated celluloses are not widely different."—Chem. Abs. 26: 6120.

192. OGURI, S. Hygroscopic moisture of cellulose. IX. On hygroscopic moistures of silk and wool. (Abs.) Soc. Chem. Indus. [Japan] J. (Sup. binding) 35: 478B-481B. 1932. J385 J82

"Tables and curves are given to show the absorption of H_2O by silk and wool at various relative humidities and the calcd. heat of sorption."—Chem. Abs. 27: 1180.

193. OGURI, S. Hygroscopic moisture of cellulose. X. On the velocity of sorption of water vapour on cellulose. (Abs.) Soc. Chem. Indus. [Japan] J. (Sup. binding) 35: 507B-515B. 1932. J385 J82

"The sorption of H_2O vapor by cotton and other celluloses under const. pressure and temp. proceeds in 2 stages at least. The velocity of sorption in each stage is expressed fairly well by Lagergren's equation: $dx/dt = k(x_\infty - x)$; where x_∞ and x are the amts. of H_2O sorbed at equil. and at time t, resp. and k is a const."—Chem. Abs. 27: 1164.

"The sorption velocity of H_2O vapour on cellulose of varying origin and on fibrous materials such as wool and silk is examined. The sorption of H_2O vapour on cotton and other celluloses at const. pressure and temp. proceeds in at least two stages, the velocity in each being represented fairly well by $dx/dt = k(x_\infty - x)$ where x and x_∞ denote the sorption at time t and at equilibrium, respectively."—Brit. Chem. Abs., A, 1933: 121.

194. URQUHART, A. R., and ECKERSALL, N. The adsorption of water by rayon. Textile Inst. J. 23: T163-T170. Aug. 1932. 73.9 T31

"The methods previously developed for cotton (cf. C. A. 25, 1089) are applied to the detn. of the regain-relative humidity curves for a series of rayons, most of which are in the form in which they are, or were, commercially available. The results are of interest chiefly as data for reference purposes, and are in general agreement with those of earlier workers."—Chem. Abs. 26: 6147.

195. ADAM, N. K. Surface films of cellulose derivatives on aqueous solutions. Faraday Soc. Trans. 29: 90-110. Jan. 1933. 382 F22

"The spreading of Me, Et and benzyl ethers of cellulose, of cellulose nitrates, acetates and esters with other fatty acids up to 18 C atoms in length, was studied by measurements of surface pressure and area and by ultramicroscopic examn. of the films. All ethers spread completely on water, the esters, incompletely, to films one glucose group in thickness. Conclusions: (a) The chains lie with every glucose ring nearly flat on the water, (b) the chains are flexible, and may be vibrating vigorously, in some cases, in the plane of the surface at low compressions, (c) the differences in ease of spreading are partly due to the different adhesion of the esterified or ether groups to the water and partly to the lateral ad-

195. ADAM, N. K. (Cont.)
hesion between the chains in the solns. of the cellulose derivs. The spreading of some common plasticizers was studied alone, and mixed with benzylcelluloses and nitrocelluloses. All expts. are of interest in connection with the problem of detg. the range of mol. attraction."—Chem. Abs. 27: 1802.

196. BARTELL, F. E., and OSTERHOF, H. J. Adhesion tension. Pressure of displacement method. J. Phys. Chem. 37: 543-552. 1933. 381 J822

"The preliminary work on the pressure-of-displacement method is reviewed and the method described in detail. Adhesion tension and work of adhesion are reported for C and for SiO_2 against water and against 19 org. liquids. The order of the series of liquids showing increasing adhesion tension against SiO_2 is just the reverse of the order against C. For each liquid the sum of the adhesion tension against C and against SiO_2 is practically const. When the values for the work of adhesion are considered from the point of view of molecular orientation the results are in approx. the order expected."—Chem. Abs. 27: 3868.

197. BEISER, W. Mikrophotographische quellungsuntersuchungen von fichten- und buchenholz an mikrotomschnitten im durchfallenden licht und an holzklötzchen im auffallenden licht. Kolloid Ztschr. 65: 203-211. 1933. 384 Z315

"Observations on microtomic sections, 10-15μ thick, swollen in damp air, water, 1% SO_2, and 0.1% NaOH soln., showed a thickening of the cell walls and different expansions in the radial and tangential directions. The results were not directly comparable with the microscopic observations on small blocks or with the macroscopic results, probably because of the absence of restraining forces existing in blocks of wood and in the original wood. The results on blocks of late wood are several % lower than on the microtomic sections and are in agreement with the macroscopic results. The tangential and radial swelling of late wood with thick walls is somewhat greater than that of early wood, which often shows a slight decrease in the radial direction. For wood blocks cut against the grain, swelling is greater in the tangential direction than in the radial."—Chem. Abs. 28: 1163.

198. BELL, J. H. B. The effects of beating on fibrous cellulose. Parts I-II. Soc. Chem. Indus. J., Trans. and Commun. 52: 109T-116T, 119T-130T. 1933. 382 M31

"I. A review (85 references) and discussion of beating are given on the basis of the chemistry, minute structure and colloidal properties of fibers and their suspension and sheet properties.

"II. Drainage properties of fibers were studies by means of a devised 'flowmeter.' The cohesion and d. of beaten pulp and its retention of H_2O under pressure were studied by use of a devised piston-cylinder app. to wet-press an 8-g. equiv. of pulp to a vol. of 18 cc. for subsequent drying. The 'cohesion const.' = 1000 [(wet vol./dry vol.) - 1]. The strength properties, particularly bursting, of test sheets formed from gasoline, EtOH and H_2O suspensions of fibers beaten in those liquids corresponded to the results of the cohesion method. Satisfactory felting occurred in EtOH, but the low strength of the resulting sheets indicated that the formation of the colloidal surface film requires the presence of H_2O and a wet-pressing treatment. In beaten fibers a chain of oriented water mols. links the active hydroxyls of the cohering cellulose micelles in such a way that the strength of cohesion depends on the shortness of the chain. Water alone can function as a dipole in this sense. Some obstacle exists to the formation of such a chain between unbeaten fibers. This may be the non-cellulosic membrane substance of Lüdtke (cf. C. A. 25, 3691)."—Chem. Abs. 27: 3327.

199. CLARK, G. L., and SOUTHARD, J. Imbibition by cotton fibers of water and of solutions of chemical reagents. J. Home Econ. 25: 228-234. 1933. 321.8 J82

"Photomicrographs and X-ray studies of cotton show that the dimensions of the unit cell of cellulose are not changed by absorption of H_2O. The H_2O is held between the cells, possibly by hygroscopic materials present there. The different parts of a cotton fiber vary in structure and in soly."—Chem. Abs. 27: 2306.

200. NEALE, S. M. The modification of natural cotton cellulose by swelling and by degradation. Faraday Soc. Trans. 29: 228-238. Jan. 1933. 382 F22

"The purpose of this review is to show that cotton purified by a dil. alkali boil is a material of more or less definite properties, and to indicate the essential lines along which this material can be modified. A compilation of consts. is included."—Chem. Abs. 27: 2031.

201. OKAMURA, I. Einwirkung von lauge auf native und merzerisierte cellulose. Naturwissenschaften 21: 393-394. May 26, 1933. 474 N213

"For native purified ramie and for the hydrated product (treated with a soln. of 21.6 g. NaOH per 100 cc., washed and dried) the heats of reaction were detd. at 25° with NaOH of concn. up to 48 g. per 100 cc. The heats of wetting were separately detd. (3.66 cal. per g. for native ramie, 6.09 cal. per g. for hydrated material). The heat effect of alkali treatment corrected for wetting is quite different for the 2 materials at low alkali concn. (up to 20 g. NaOH per 100 cc.), hydrated ramie giving the larger heat effect. At alkali concns. sufficient for actual mercerization (lattice change) most of the difference disappears and remains const., native cellulose having a somewhat higher heat effect (heat of transformation). All heat effects increase with rising alkali concn."—Chem. Abs. 27: 4667.

202. SHEPPARD, S. E. The structure of xerogels of cellulose and derivatives. Faraday Soc. Trans. 29: 77-85. Jan. 1933. 382 F22

"Probably about 5% H_2O can combine with the OH groups on the surface of cellulose micelles, the rest of the H_2O being in capillary spaces. Sorption of H_2O by combination with OH is diminished by esterification or etherification of the OH, and sorption in capillaries is diminished by incorporating non-solvent liquids and by esterifying with acids of high mol. wt. Molar sorption of primary alcohols falls with increasing mol. wt. to a const. val. for alcohols with > 3 C atoms, and it is assumed that the mols. of such alcohols are too large to penetrate capillaries. Diffusion of H_2O vapour into films of cellulose esters obeys Fick's law after an initial period of 1-1.5 hr. Isotropic films of cellulose esters can be obtained by evaporating the solutions on a Hg surface. When dried on a solid surface the film is uniaxial, and if it is then swollen and dried while stretched in one direction it is biaxial."—Brit. Chem. Abs. 1933, A: 226.

203. WALKER, A. C. Effect of atmospheric humidity and temperature on the relation between moisture content and electrical conductivity of cotton. Textile Inst. J. 24: T145-T160. Apr. 1933. 73.9 T31

"Data are given to show the effect of successive equil. humidity cycles on the relation between relative humidity and moisture content; insulation resistance and relative humidity; and insulation resistance and moisture content for raw and H_2O-boiled cotton at 25°. These data are helpful in explaining the dependence of the behavior of cotton, e.g., its d.c. insulation resistance when measured at some definite test condition, upon its previous treatment. Three equations are given for characterizing nearly the whole range of moisture absorption of cotton between dryness and satn."—Chem. Abs. 27: 3340.

204. BANCROFT, W. D., CALKIN, J. B., and STILLWELL, C. W. Effect on the X-ray pattern of drying caustic pretreated cotton. Textile Res. 4: 411-412. July 1934. 304.8 T293

"X-ray patterns of parallel bundles of wet, air-dried and heat-dried pre-treated cotton were obtained. The data show no change in the X-ray pattern commensurate with the change in adsorption indicating that the sintering occurring during drying is an intermicellar shrinkage and not an intramicellar shrinkage, as the latter would require a change in the pattern."—Chem. Abs. 28: 7025.

205. BERTHIER, P. Influence de la tension superficielle sur la vitesse d'ascension des solutions aqueuses à travers les corps poreux. [Paris] Acad. des. Sci. Compt. Rend. 199: 1221-1223. 1934. 505 P21

"Comparison of the rates of ascension in filter paper of H_2O and solns. of varying surface tensions, 27.5-61 dynes/cm., showed that surface tension has little if any effect on the rate, the slight effect observed in one case being apparently due to change in viscosity."—Chem. Abs. 29: 660.

206. BURLET, E. Les propriétés hygrométriques des textiles et le conditionnement des soies artificielles. Chim. & Indus. [Paris] Special No.:824-832. Apr. 1934. 383 C42

"The equil. moisture content attained by a given sample of a textile fiber in an atm. of definite temp. and relative humidity varies with the past humidity history of the fiber, particularly with rayons. The true wt. of a sample under standard conditions may be obtained by dividing the sample into 2 halves, drying one half (below 60°) and moistening the other half, exposing both halves to the standard atm. (generally 18° and 65% relative humidity) for several hrs. and weighing."—Chem. Abs. 28: 5990.

207. HESS, K. Kinematographische quellungsanalyse. Papier Fabrik. 32(6): 61-67. 1934. 302.8 P197

"The swelling of cotton and wool fibers and starch granules is studied with the aid of a cinematographic film, some pictures from which are reproduced. When cotton swells in cuprammonium oxide soln., the soln. passes through the outer walls of the fiber, which act as a semipermeable membrane, causing dispersion of the structure within the fiber. A strong flow of particles in the direction of the axis of the fiber was observed, the particles themselves showing vigorous Brownian movement. The outer walls finally burst and a very rapid outflow of liquid from the fiber takes place, an indication that the system is under pressure. Starch granules show the same behavior when swelling in H_2O. The particles of the inner suspension, which also show vigorous Brownian movement, become visible only with the addn. of EtOH, MeOH, dioxane, Et_2O, etc. It is indicated that the suspension ejected when the outer skin of the granule is burst has its own inner structure with elastic properties. Similarly the individual scales split off from the surface of wool when swollen show Brownian movement within."—Chem. Abs. 28: 6360.

208. KANAMARU, K. Adsorption und quellung von zellulose in elektrolytlösungen variierender konzentration. Kolloid Ztschr. 66: 163-175. Feb. 1934. 384 Z315

"Cellophane was washed in boiling dist. water until the pH was const. (prepn. I). Two samples were subjected to a pretreatment with 1% NaOH or 1% HCl. (prepns. II and III, resp.). The pH after adsorption by washed I in HCl, H_2SO_4 and NaOH solns. was determined with a H electrode. Plotting H and OH ions adsorbed against the pH yielded two curves tending to become asymptotic at pH 7.4 which is an apparent isoelec. point. At this point, the swelling is 63% and hence the point is not a true isoelec. point but one at which hylotropic adsorption occurs. For examples II and III this point lies at pH 8.15 and 5.20, resp. The swelling-pH curves show maxima and minima in acid and alk. solns.; swelling is less in H_2SO_4 than in HCl solns. Swelling and ζ -potential curves are parallel in KCl solns. $AlCl_3$ solns. reverse the charge of the cellulose with a true isoelec. point at pH 4.65."—Chem. Abs. 28: 2595.

209. KANAMARU, K. Über das lichtbrechungsvermögen der cellulose und ihrer derivate. III. Der einfluss des adsorbierten wassers auf das brechungsvermögen von cellulosefasern. Helvetica Chim. Acta 17: 1425-1429. 1934. 385 H36

"During absorption of H_2O by dried ramie fibres the refractive index perpendicular to the fibre axis (n_a) remains approx. const., whereas n_γ (parallel to axis) passes through a min. An explanation is suggested."—Brit. Chem. Abs. 1935 A: 148.

210. KÜSEBAUCH, K. Das verhalten von baumwollsorten verschiedener herkunft bei bestimmten quellungsvorgängen. Melliand Textil. Ber. 15: 193-194. 1934. 304.8 T312

English translation in Internatl. Cotton Bul. 11: 703-705. 1933. 72.8 In8

"Observations of the swelling of cotton hairs under specified conditions are useful in determinations of the quality and origin of cottons. A bundle of hairs is prepared from the raw cotton or yarn to be tested and is cut into two; one section is immersed in glycerin and the other in Molisch's solution (2 parts caustic potash of 30° Bé. and 1 part 25% ammonium hydroxide solution), and the diameters of the hairs are measured with a microscope. The swelling in the Molisch solution is measured by the difference in diameters in the two cases and a swelling standard value is calculated from the arithmetic and geometric means of the width measurements in the two solutions. The results of tests on Egyptian, American, and Indian cottons are given. The increase in diameter on swelling is generally greater the finer the cotton. This increase, considered in relation to maturity, gives an indication of the mercerising and dyeing properties of the cotton. The swelling standard value increases with decreasing fineness of the cotton and may be used as an aid to the determination of the origin of cotton."—Textile Inst. J. 25: A362.

211. LEVEY, H. A. The transmission of water vapor through cellulosic membranes. Plastic Prod. 11(2): 52-53. Aug. 1934. 309.8 P69

"The amt. of water vapor transmitted from an atm. of 100 to 50% relative humidity at 70° F. was detd. for papers, regenerated cellulose and cellulose esters and ethers. The max. transmission was obtained for regenerated cellulose, and the min. was obtained for the esters and ethers."—Chem. Abs. 28: 6300.

212. PRESTON, M. H., and MATTHEW, J. A. Absorption of water by linen. Part I. Flax yarns. Textile Inst. J. 25: T311-T330. Oct. 1934. 73.9 T31

"An app. for measuring the absorbency of yarns and fabrics is described, and the necessary precautions to ensure reliable comparisons of samples are deduced from results obtained by varying the exptl. conditions. The app. provides for drawing a quantity of yarn or strip of fabric through water under controlled conditions. The two aspects of absorbency, namely the completeness of wetting after a fixed time of immersion and the amt. of water held, are measured separately, and are found sometimes to vary differently. The completeness of wetting (expressed as percentage of fiber surface wetted or apparent d. in water of the partly wetted fiber in the yarn) increases rapidly with time of immersion, reaching an approx. const. value within a very short time; the rate of wetting increases with increase of temp. of the water... An inverse relationship between the compactness of the yarn and the percentage of water held is shown."—Chem. Abs. 29: 3168.

213. SCHWERTASSEK, K. Studien der sorptionsfähigkeit an mercerisierter baumwolle. Melliand Textil Ber. 15: 269-271. 1934. 304.8 T312

"Treatment of mercerized cotton with dil. acid (H_2SO_4) lessens its sorption capacity. Higher washing and drying temps. both have this effect also. If, however, the mercerized cotton has been first dried at ordinary temps., its sorption capacity does not change on subsequent heating (105°). Repeated washings and dryings cause steady lowering of sorption capacity up to a limit which is reached in the neighborhood of 6 treatments. A study of the sorption capacity of piece mercerized and yarn mercerized cotton confirmed the general idea that yarn mercerization is more thorough. The type of fabric influences the degree of mercerization of piece goods."—Chem. Abs. 28: 6571.

214. STEINBERGER, R. Elastic and plastic properties of textile fibres. Part I. The stress-strain relation in textile fibres. Review of literature. Textile Res. 4: 207-234. Mar. 1934. 304.8 T293

"A description is given of a tension gage with telescope and scale for measuring stress-strain relation in fibers several cm. long. In the rayons, there is an initial linear portion followed by a long region of plastic flow. Silk and wool are wholly plastic with no linear region. Cotton is linear throughout."—Chem. Abs. 28: 7023.

215. STEINBERGER, R. Elastic and plastic properties of textile fibres. Part II. The stress-strain relation in textile fibres: Improved technic. Textile Res. 4: 271-285. Apr. 1934. 304.8 T293

"Improved app. and technic were used in obtaining results similar to those above. [i.e., tension gage with telescope and scale for measuring stress-strain relation in fibers several cm. long.]"—Chem. Abs. 28: 7023.

216. WELTZIEN, W. Quellung und mechanik von natürlichen und künstlichen cellulosefasern. Papier Fabrik. 32: 433-437. 1934. 302.8 P197

"Natural fibers are characterized by their biol. structure, mixt. of cellulose constituents of different swelling abilities, resistance to soln. in alkali, etc. In complete absence of O_2, cotton and ramie dissolved in 17.5% aq. NaOH to the extent of 10-15%; their strength was unaffected. In the case of artificial fibers, increase in alkali soly. decreases their wet strength; but their swelling ability, which is always greater than that of natural fibers, is governed primarily by the spinning process. The importance of their change in length with change in relative humidity, and the resumption of their original length on soaking in H_2O after previous stretching, in mfg. a uniform product is discussed. Absence of stretch is essential to obtain uniform dyeing."—Chem. Abs. 29: 4935.

217. WELTZIEN, W., and RHEIN, W. Die feuchtigkeitsaufnahme und-abgabe von faserstoffen in abhängigkeit von der luftfeuchtigkeit und temperatur. Monatsh. f. Seide und Kunstseide 39: 343-349, 390-394. 1934.

"A simple method is described for detg. dependable figures for the absorption and loss of moisture of various textiles within moderate changes of conditions. The app. is shown by a drawing. A curve is included showing the swelling isotherm of cotton which had been boiled with soda and then dried at 110°. The textiles studied comprised natural silk, cotton, cuprammonium rayon, viscose rayon, acetate rayon, celta and crepe. A large no. of numerical results are tabulated showing the change of moisture of textiles at 16-18°, the influence of temp. on the moisture content of rayons, and the effect of sizing

217. WELTZIEN, W. (Cont.)
and torsion on rayons. The results show that slight changes in temp. have only a slight effect on the moisture content of acetate rayon but a considerable effect on the moisture content of viscose and cuprammonium rayon. The effect of sizing on acetate rayon is practically negligible. Yarns sized with linseed oil yield lower figures for the moisture content than yarns which had not been sized while water-sol. sizes have no nominal effect. The changes in the moisture content of these textiles during slight changes give a very clear indication of the great sensitivity of fibrous material to changes in exterior conditions. As every change in the moisture content of rayons is generally followed by a change on length it is evident that these slight variations in conditions are of great importance."—Chem. Abs. 28: 7023.

218. ARGUE, G. H., and MAASS, O. Measurement of the heats of wetting of cellulose and wood pulp. Canad. J. Res. 12: 564-574. 1935. 330.9 C16C

"The heats of wetting of dry cellulose and wood pulp have been measured for the first time. The influence of the initial water content of the cellulose on the heat of wetting has been detd. It is shown that when the water is left as a result of partial desorption a higher value is obtained. The heats of wetting of wood meal and different wood pulps have been detd. The heats of adsorption were calcd., and all the data are discussed from the point of view of the phys. structure of cellulose. A few preliminary measurements of the heat of adsorption of NaOH were made. The exptl. technic of using a rotating adiabatic calorimeter is shown to be admirably adapted for measurements of this kind."—Chem. Abs. 29: 5652.

219. ARGUE, G. H., and MAASS, O. Measurement of the variation of the dielectric constant of water with extent of adsorption. Canad. J. Res. Sect. B. Chem. Sci. 13: 156-166. Sept. 1935. 330.9 C16C

"An exptl. technic was devised for measuring the dielec. consts. of cellulosic materials contg. various amts. of adsorbed H_2O. From measurements made with standard cellulose the dielec. const. of the adsorbed H_2O was calcd. over the concn. range 0 to 18% of H_2O. The dielec. const. of the H_2O initially adsorbed is less than one quarter of that of liquid H_2O, but it increases with the amt. of H_2O subsequently adsorbed, until the dielec. const. approximates that of liquid H_2O as the H_2O content of the fiber approaches the satn. point. These results agree with the hypothesis concerning the nature of the system cellulose-water."—Chem. Abs. 30: 341.

220. BAILEY, I. W., and KERR, T. The visible structure of the secondary wall and its significance in physical and chemical investigations of tracheary cells and fibers. Arnold Arboretum J. 16: 273-300. July 1935. 451 Ar6J

"1. An extensive survey of a wide range of gymnosperms and angiosperms has shown that the structural pattern of the secondary wall is clearly visible in the large fiber-tracheids and libriform fibers of various dicotyledons. ...

"3. The cellulosic matrix of the swollen secondary wall of cotton, as of normal tracheids, fiber-tracheids, and libriform fibers, is an extremely heterogeneous but firmly coherent structure, the finer details of which grade down to the limits of microscopic visibility. ...

"7. The orientation of the elongated complexes of the structural pattern fluctuates more or less in successively formed parts of the secondary wall. In the case or normal tracheids, fiber-tracheids, and libriform fibers, there are three layers due to varying orientations: narrow inner and outer layers, in which the orientation is more nearly at right angles to the longitudinal axis of the cell, and a central layer of varying width, in which the orientation is parallel to this axis or does not deviate excessively from it.

"8. 'Lignin' and other non-cellulosic constituents may be deposited in the elongated, intercommunicating interstices of the cellulosic matrix, thus resulting in two continuous, interpenetrating systems. In heavily lignified forms, either system may be dissolved without seriously modifying the structural pattern of the remaining system. The purified cellulose and the 'lignin' residue reveal positive and negative images of the original structural pattern.

"9. Deviations from the typical 3-layered type of secondary wall are of not infrequent occurrence. Thus, many thick-walled libriform fibers and fiber-tracheids have no clearly differentiated inner layer; whereas others have more than three layers of varying 'fibrillar' orientation.

"10. Conspicuous discontinuities in the structural pattern of the cellulose commonly occur in the multiple-layered walls of so-called gelatinous fibers, in certain types of bast fibers, and in sclereids. They are due to narrow layers of truly isotropic material which contain little, if any, cellulose. ..."—Authors' summary and conclusions.

221. BANCROFT, W. D., and CALKIN, J. B. The adsorption of caustic soda by cellulose. J. Phys. Chem. 39: 1-9. 1935. 381 J822

"Adsorption of NaOH and of H_2O by A.C.S. Standard cotton can be detd. by centrifuging the wetted cotton, and detg. the point at which all the mother liquor has been removed. The "true" adsorption curve of NaOH by cellulose is smooth and there is no indication of stoichiometric compd. formation (in any large amt.) over a range of varying NaOH concns. up to 20%. B. and C. thus take issue with previous investigators, especially Vieweg. Excepting dil. NaOH solns., the apparent adsorption is a partially irreversible process due to an irreversible change in the space lattice, and to swelling which can be more or less completely reversed at 105°. A large part of the exptl. data on which the above conclusions as well as B. and C.'s graphs are based were published elsewhere. (cf. C. A. 28, 7000)."—Chem. Abs. 29: 2737.

222. KAPADIA, D. F. Effect of humidity on strength and extension of cotton yarn. Indian Textile J. 45: 266-270. 1935. 304.8 In2

"Different varieties of cotton are affected differently by humidity. The effect is less for finer counts spun with a higher measure of the twist const. than for coarse counts spun from the same cotton. Ballistic tests do not agree with single-thread tests. On the whole for a change of 10% relative humidity (R.H.) the strength of yarn tested in singles was affected to the extent of 3.03% of the strength at 70% R. H., and the change in extension value was 6.441% of the extension value at 70% R. H. For a change of 10% R. H., the strength of yarn as detd. by ballistic tests was affected to the extent of 3.84% of the strength at 70% R. H. Theories of moisture absorption by cotton fibers are reviewed."—Chem. Abs. 29: 6066.

223. LYKOV, A. V. [The kinetics of the sorption of vapors by cellulose.] Zhur. Fizicheskoi Khim. 6: 731-746. 1935.

"L. studied the kinetics of the adsorption and absorption of water vapor from moist air by a sphere of 6.6 cm. diam. of pure dry celluloses at 20-75° and 62-100% relative humidity. The internal temps. of the sphere were followed by 3 thermocouples. By use of the Fick surface layer and internal-diffusion laws, the sorption law and its coeffs. were detd. The coeff. of internal diffusion varies, increasing with increase of temp. and speed of the surrounding air and with decreasing relative humidity. The coeff. of internal diffusion increases with temp. and is independent of other factors."—Chem. Abs. 31: 23.

224. MEYER, M., and FREY-WYSSLING, A. Das lichtbrechungsvermögen der cellulose in funktion des quellungsgrades. Helvetica Chim. Acta. 18: 1428-1435. 1935. 385 H36

"In detg. ^nD of colloids subject to swelling, an immersion method (in which the entire fiber is encased with, but not penetrated by, the immersion liquid) must be used. The imbibition method (i.e., the procedure in which the fiber is soaked for 2 days in mixts. of known n_D) was found unsuitable. Abs. immersion without penetration cannot be attained, but it can be approximated by shortening the periods of imbibition as much as possible. As the swelling increases, the n_a (parallel to the fiber axis) and the n_o (perpendicular to the fiber axis) of cellulose, decrease steadily, although very slightly. In ramie fiber, starting with 0% H_2O and ending with 24.4% H_2O, the n_a changes from 1.5962 to 1.5900, and n_o from 1.5316 to 1.5281. These results are discussed in the light of previous data, especially those of Kanamaru (C. A. 29, 2737)."—Chem. Abs. 30: 1555.

225. MORTON, T. H. The dyeing of cellulose with direct dyestuffs; the importance of the colloidal constitution of the dye solution and of the fine structure of the fibre. Faraday Soc. Trans. 31: 262-284. Jan. 1935. 382 F22

"(1) The fine structure of viscose cellulose is shown to possess, in the unswollen state, a pore diameter of less than 5 A.U., and in the normal swollen state 20-30 A.U. This value may be increased 5-fold by swelling in sodium hydroxide solution. Experiments in an alcoholic medium show that direct dye molecules can only penetrate the capillaries in the swollen state. (2) The rate of diffusion of the most rapid dyeing of the direct dyes within the cellulose capillaries approaches that for free diffusion in water; that for the slowest dyes is 10^{-4} of this value; (3) Ultrafiltration experiments, using cellulose membranes, show that the degree of aggregation is greater with the slow dyeing than with the rapid dyeing colours. (4) A solution of a direct dye probably contains aggregates of molecules of all sizes from a single molecule upwards. A probable distribution of particle sizes has been indicated, and it is shown that the dyeing kinetics to be expected of such a solution are essentially those observed in the dyeing of viscose."—Author's summary.

226. OGURI, S., and YOSHIDA, T. Hygroscopic moisture of cellulose. XIII. Indirect determination of the heat of the sorption of water vapour on cellulose. (Abs.) Soc. Chem. Indus. [Japan] J. (Sup. binding) 38: 434B-436B. 1935. J385 J82

"An app. is described which uses a chem. balance. Standard cotton cellulose was used for the expts., and about 30 hrs. was required for establishment of the sorption equil. Results at 15.00°, 20.00° and 25.00° are reported. The heat of sorption was calcd. by means of the Clausius-Clapeyron equation, and data are presented for sample moistures of 6.00-16.00%. Graphs are shown for percentage of H_2O against vapor pressure and percentage of relative humidity. The points at different temps. lie on a single curve for the temp. range covered when plotted against the relative humidity: this indicates that the sorption of water vapor will be almost independent of the temp. if the relative humidity is kept const."—Chem. Abs. 29: 8323.

227. OSBORNE, G. G. Micro-analysis of textile fibers. Part III. Observations on the structure of cotton. Textile Res. 5: 275-295, 307-323. 1935. 304.8 T293

"Certain generalities concerning cotton (already known or surmised) have been substantiated, while others have been rejected. In add. several minor aspects of cotton fiber comp. are reported for the first time. A detailed microanalysis of the cotton fiber divides it into 4 main parts: cuticle, primary wall, secondary wall, and lumen. Each of these has been scrutinised carefully, and descriptions of their component structure together with illustrative material are given. Several theoretical aspects of the subject are considered and the fiber's mol. arrangement, growth mechanism and intermicellar make-up are discussed. Fifty-nine references."—Chem. Abs. 29: 4947.

228. SAKURADA, I., and FUCHINO, K. [Entering of water in the crystal lattice of cellulose.] (In Japanese) [Tokyo] Inst. Phys. and Chem. Res. Bul. 14: 171-176. 1935. 513 T577B

"The ramie fiber dipped into 18% NaOH (by vol.) at the ordinary temp. and washed 2 hrs. with distd. water until completely free from alkali, gives an X-ray pattern quite different from that of natural cellulose, cellulose hydrate or unwashed Na cellulose I; this verifies the entrance of water into the lattice of cellulose. In such cellulose, water is thought to be combined with cellulose forming a true water-cellulose compd.; some of the Na cellulose IV of Schramek (C. A. 27, 2574) and Na cellulose III of Trogus and Hess (C. A. 26, 6122) seems to be nothing but this water-cellulose compd."—Chem. Abs. 29: 5649.

229. SALLEY, D. D. J. The adsorption of carbon dioxide and of water vapor by paper pulp. Textile Res. 5: 493-508. 1935. 304.8 T293

"Adsorption isotherms for CO_2 and for H_2O vapor on slightly beaten and well-beaten paper pulp were measured over a range of temp. A correlation of the results with the known structure of cellulose and with present ideas concerning the effects of the beating process is presented."—Chem. Abs. 30: 1996.

230. STAMM, A. J., and SEBORG, R. M. Adsorption compression on cellulose and wood. I. Density measurements in benzene. J. Phys. Chem. 39: 133-142. 1935. 381 J822

"The apparent adsorption compression of H_2O on cellulosic materials has been measured in C_6H_6. The results indicate that the compressive force is of the order of a few thousand atm. instead of 100,000 atm. as required by the results of Filby et al. (A, 1932, 1087). Adsorption compression extends to the fibre-saturation point."—Brit. Chem. Abs. B 1935: 398.

231. BOSSUYT, V. Propriétés mécaniques des fibres cellulosiques naturelles et mercerisées. Soc. Chim. de France. Bul. Mém. (Série 5) 3: 1975-1982. 1936. 383 P21B

"Extension-load curves have been detd. for natural and mercerized ramie fibers in dry and moist air, H_2O, $HCONH_2$, aq. LiCNS and aq. NaOH, and for natural cotton, hemp and flax fibers in dry and moist air. The curves obtained are of the same form except in cases where combination occurs (LiCNS and NaOH). The rapidity with which load-extension cycles attain their final form increases with the degree of perfection of the cryst. orientation in the original fiber, and expts. of this kind can be used to identify different natural fibers."—Chem. Abs. 31: 7656.

232. HAMM, H. A., and PATRICK, W. A. The retentivity of water by purified cotton cellulose. Textile Res. 6: 401-409. 1936. 304.8 T293

"The adsorption of water vapor by cellulose was studied under conditions to ensure equil. Under these conditions, it was found that cellulose exhibited no hysteresis."—Chem. Abs. 30: 7329.

233. HARTSHORNE, W. D. Some comparative data on moisture in cotton and worsted. Natl. Assoc. Wool Mfrs. Bul. 66: 311-335. 1936. 45.9 N21B

"A detailed description is given of expts. on moisture absorption at various temps. and degrees of humidity, and under normal outdoor conditions. A standard regain of 15% for worsted is conservative for the United States. For cotton 7.5% is standard. The ordinary stationary wet- and dry-bulb thermometer arrangement for detg. the atm. humidity is unsatisfactory for mill use. The U. S. Weather Bureau sling hygrometer or psychrometer is the most satisfactory and accurate instrument for this work. The condition of 100% humidity is unstable and difficult to observe; if a worsted yarn is found to contain a materially greater amt. of moisture than is represented in the tables for 100% humidity it would seem to indicate a deposit of water rather than the occlusion of aq. vapor."—Chem. Abs. 31: 7256.

234. KING, T., and OUELLET, C. Sorption of deuterium oxide by cellulose. Canad. J. Res. Sect. B, Chem. Sci. 14: 444-449. Dec. 1936. 330.9 C16C

"The sorption of deuterium oxide by cellulose at 23.4° C. was investigated over the whole range of vapor pressures and found to show the same characteristics as that of water. The molar quantities sorbed at a given pressure are equal, and the kinetic curves exhibit the same features. After desorption of deuterium oxide, a small but permanent increase in the weight of the cellulose was observed. This suggested an exchange reaction between deuterium and hydrogen atoms."—Author's abstract.

235. OGURI, S., and YOSHIDA, T. [Direct determination of the heat of sorption of water vapor on cellulose with an ice calorimeter.] [Tokyo. Waseda University] Waseda Applied Chem. Soc. Bul. 13(4): 1-6 (in English, 60) 1936.

"The sorption of water vapor at 0° reached 19.94% in the presence of satd. water vapor; the heat of sorption is 915-1098 cals."—Chem. Abs. 31: 2504.

236. ROZENBROEK, M. D. Over zwellingsverschijnselen aan capillairen met zwelbaren wand. Chem. Weekbl. 33: 406-409. 1936. 385 C42

"Artificial capillaries of gelatin made in glass tubing with concentric glass rods swell upon contact with water. If one end is closed the capillary can only fill itself partly and then swells to close off or decrease the size of the open end. The relative rates of swelling and of penetration of the water in the capillary det. the extent of penetration. Cotton fiber (cellulose) swells more readily than gelatin but similar effects are observed upon suspending pieces of cotton fabric in water and detg. the time required for it to sink. This time is a measure of the rate of swelling of the cotton. Air-dry cotton (7.8% H_2O) takes water up at a slower rate than stove-dried (105°) cotton; the latter swells more rapidly and hence takes longer to sink (22 sec. vs. 10 sec.) The same difference is found between air and stove-dried native cotton or bleached cotton fabrics. Substances that retard swelling like EtOH, AmOH, CCl_4, C_6H_6, CS_2, vapor of NH_3 soln. cause more rapid sinking (5.5 to 13 sec. for stove-dried cotton exposed to above vapors for 5 days) at 16° in a 50% soln. of butylated sulforicinolic acid (strongly wetting). The mechanism of the retardation is a surface protection of the fiber. The reverse effect is obtained with dry NH_3 gas; it promotes the swelling of the cotton distinctly; the fiber takes 91 sec. to sink."—Chem. Abs. 31: 1679.

237. SAKURADA, I., and HUTINO, K. Über die intramizellare quellung der zellulose durch wasser. Kolloid Ztschr. 77: 346-351. Dec. 1936. 384 Z315

"It was shown by X-ray measurements that Na-cellulose I (prepd. by the action of 16 wt.-% NaOH upon ramie), which had been washed with water until it was free from alkali, gave a new and fairly sharp X-ray diagram which indicated the penetration of water into the crystal lattice of the cellulose. This hydrate cellulose is designated as 'water cellulose' (I). The formation of the I is indicated by the displacement of the A_1-interference. I is stable indefinitely if kept in water at room temp. It is also stable towards mineral acids. If dried in air it is changed to hydrate cellulose even at 25°, although this

237. SAKURADA, I. (Cont.)
change is very slow at the lower temps. If the Na-cellulose I is washed at higher temps. the A_1 -interference displacement is decreased. At 100° the usual hydrate cellulose is obtained instead of I. The following consts. were found for the I: a:b:c = 10.03:10.3:9.98, β = 52°, V = 817 A^3. Similar crystal lattice broadening had been observed with Li cellulose, K cellulose and cellulose xanthate. This effect has also been noted in the regeneration of hydrate cellulose from cuprammonium soln. or from H_2SO_4 soln., but the reaction proceeds in a different manner. I swells more strongly in water than does hydrate cellulose."—Chem. Abs. 31: 3259.

238. SETZER, R. Feuchteauf- und -abnahme von baumwollgarnen. Melliand Textil Ber. 17: 714-716. 1936. 304.8 T312

"An arrangement for studying the rates of adsorption and desorption of moisture by yarn forming the inner layers of wound packages comprises a closed chamber into which are introduced a thermometer and two hygrometers of the type in which the sensitive hair element is enclosed in a perforated tube. The yarn is wound tightly round the tube of one hygrometer to form a layer 18mm. thick and metal discs are placed at each end. The system is left until both hygrometers give the same reading and the humidity of the air in the chamber is then rapidly increased to 90 per cent. The readings of the hygrometers are recorded and when the hygrometer carrying the yarn records 90 per cent. the humidity of the air is rapidly reduced to its original value and hygrometer readings are again recorded until the original value is again reached. Graphs showing the results obtained with cotton yarn and cotton roving together with the moisture contents corresponding to the hygrometer readings are given. It is pointed out that cotton roving is more sensitive to changes in humidity than cotton yarn, the yarn experiment taking twice as long as the roving experiment. The adsorption of moisture by yarn wound on a warp beam and the need for humidification in weaving sheds are briefly discussed."—Textile Inst. J. 27: A628.

239. ADAM, E., and KRAIS, P. Über die bestimmung der wasseraufnahme von textilfasern. Monatschr. f. Textil. Indus. 52: 85. 1937. 304.8 L53

"The water absorption of 0.5-g. samples of Cl Buenos Aires wool and of A/AA Austral wool was detd. as follows: The samples were wetted with water, squeezed by hand and placed in a small tin vessel with perforated bottom. The vessel was attached to a string and centrifuged 50 times at a velocity of 2 revolutions per sec.; 2-5 expts. yielded a uniformity of 92-93% in the results. The increase in wt. found after centrifuging expressed in percentage of the sample was taken as a measure of the water absorption and amounted to 97 and 288%. Several addnl. series of tests were conducted under varying conditions and with modifications of the procedure described. Results are given for various kinds of rayon and cotton."—Chem. Abs. 31: 4127.

240. BOGOIAVLENSKII, F. I. K voprosu o gigroskopichnosti i gisterezise merserizovannoi tsellyulezy. Kazan. Universitet. Uchenyia Zapiski. 97(8[Khim, No. 2]): 83-92. 1937. 511 K18u

"During mercerization of cotton, the moisture hysteresis increased and reached a max. if a cotton were mercerized with 4 (and higher) N NaOH or with 6 (and higher) N KOH. That corresponds to the limit of adsorption. The hygroscopicity of mercerized cotton gradually increased with an increase of the concn. of mercerizing soln. and reached a max. at the above concns. of NaOH and KOH. The max. hygroscopicity of cotton mercerized with NaOH is 1.4-1.6, and with KOH 1.7 times higher than that of unmercerized cotton (20.5%). This probably, can be explained by the increase of adsorbing surface during mercerizing. Temp. change probably affects the energy of adsorption of water vapor by cellulose."—Chem. Abs. 32: 7735.

241. CHAMPETIER, G., and VIALLARD, R. Sur la pénétration de l'eau dans le réseau de la cellulose. Reaction d'échange entre la cellulose et l'eau lourde. [Paris] Acad. des Sci. Compt. Rend. 205: 1387-1388. 1937. 505 P21

"Dry cellulose was placed in 99% D_2O, and the progress of the interchange H → D followed by detn. of the d. of the mixed H_2O and D_2O collected by evapn. The interchange is at the rate of 3D per glucose group; it is complete for filterpaper cellulose in 13 hrs. at 100°, in 24 hrs. at 30°. Linter cellulose takes longer, e.g., 36 hrs. at 30°. The results indicate that adsorption of H_2O by cellulose occurs uniformly throughout the whole mass, and is not confined to a surface layer."—Chem. Abs. 32: 1543.

242. HALLER. Über die einwirkung von dampf verschiedener spannung auf das verhalten von baumwolle gegenüber reagenzien und farbstoffen. Klepzig's Textil-Ztschr. 40: 273-275. 1937.

"Raw and bleached fibers treated with a rapid steamer for 5 min. showed under the microscope no structural changes. In the raw fiber steaming increased the wetting power and increased the adsorptive power for I. In both raw and bleached fiber dyeing with indigo was greatly decreased. Treatment with mercerizing liquor of 25° Bé. did not change the structure of the raw or bleached cotton, but the intensity of Congo red dyeing of the steamed fiber was greater than that of unsteamed mercerized fiber. Steaming both fibers for 1 hr. at 1/2 and 1 atm. gave results duplicating those obtained with flowing steam on short exposure. Exposure of raw and bleached cotton to steam at 5 atm. for 1 hr. produced definite structural changes. Fibers treated with low-pressure steam become pale green upon treatment with Fehling soln.; when high-pressure steam has been used the same reagent will produce a bluish green or even an indigo-blue color. Under the microscope the raw fiber turned pale brown. In practical tests steamed cotton gave lighter vat dyeings than unsteamed cotton. Brief exposure to steam causes a definite state of permanent swelling which exerts a definite influence upon the colloidal leuco dyes in the vat."—Chem. Abs. 31: 5171.

243. HERMANS, P. H., and LEEUW, A. J. Beiträge zur kenntnis des deformationsmechanismus und der feinstruktur der hydratzellulose. II. Deformationsmechanismus, quellungsanisotropie und mechanische eigenschaften stark gequollener hydratzellulosegele. Kolloid Ztschr. 81: 300-326. Dec. 1937. 384 Z315

"Filaments of cellulose xanthate have been spun under constant conditions, then submitted to a series of swelling and de-swelling effects, and measurements made of length, diameter, volume, extension, and specific double refraction in order to calculate the swelling anisotropy. The series of 'states of swelling' are represented by (i) the fresh filament in equilibrium with 2-N ammonium sulphate, (ii) the filament extended by a definite amount on the Schopper tester (the force being recorded), (iii) after relaxation, (iv) the filament in equilibrium with 0.5-N sodium sulphate ('first swelling'), (v) equilibrium with 2-N-ammonium sulphate ('first de-swelling'), (vi) again in equilibrium with 0.5-N sodium sulphate (second swelling), (vii) in dilute sulphuric acid (regeneration of cellulose hydrate, second de-swelling), and (viii) the filament in air-dry state. The data are recorded in tables and discussed at length. They are shown to be in complete disagreement with the deformation theory of Eckling and Kratky and, as announced in a preliminary note, are interpreted on the assumption of a net-like structure in the cellulose hydrate gel."—Textile Inst. J. 29: A166.

244. KANAMARU, K., and NAKAMURA, T. Über die hydrophilen eigenschaften der zellulose. III. Über die hydrophilen eigenschaften der elektroneutralen zellulose. Kolloid Ztschr. 78: 83-87. Jan. 1937. 384 Z315

"The hygroscopicity (H) of cellulose (calico and manila paper), treated by immersion in aq. $AlCl_3$ of varying concns. and subsequent drying, has been measured by determining the H_2O-sorption isotherms. H decreases with increasing ($AlCl_3$) and reaches a min. when $Al(OH)_3$ has been adsorbed in such an amount as to make the cellulose electrically neutral. Further adsorption of $Al(OH)_3$ confers a positive charge and increases H. The dielectric strength is a max. at the isoelectric point, and varies in the opposite sense to H."—Brit. Chem. Abs. A, I, 1937: 133.

245. KERR, T. The structure of the growth rings in the secondary wall of the cotton hair. Protoplasma 27: 229-241. 1937. 442.8 P94

"The secondary wall of the cotton hair is a complex and coherent matrix, and the appearance of layering in swollen fibers is due to a structural differentiation of the cellulose into an alternation of compact, strongly birefringent zones with more porous, comparatively isotropic lamellae. 2. During the period of secondary wall deposition, two lamellae, one compact and one more porous, are deposited every 24 hours. These two lamellae constitute a daily growth ring. 3. The daily growth rings show considerable variability, both in their width and in the density of the more porous lamellae. Cotton hairs, developing at the same time may possess a similar series of varying layers, so that it is possible to cross correlate a succession of fluctuating growth rings in hairs from different plants. 4. Variations in the density of the porous lamellae may be correlated with fluctuations in the temperature during the night. When the night-

245. KERR, T. (Cont.)
ly temperatures go below 20°C., the porous zones do not stain in congo red and are well differentiated from the contiguous compact lamellae. If the temperature at night remains above 22° C., the porous zones are poorly differentiated from the compact lamellae, and stain heavily in congo red. Therefore, it is assumed that the compact zones of the growth rings are deposited during the day and the porous zones at night. 5. The width of the daily deposition of cellulose varies within relatively wide limits. Cotton hairs growing in North Carolina, with a period from flowering to maturity of 50 days, had growth rings 0.30 - 0.35μ in width, whereas cotton growing in Massachusetts with a boll period of 75 days had growth rings approximately 0.12 μ in width. 6. A cotton variety, known as 'green lint' possesses a non-cellulosic constituent, which is present in the secondary wall and is insoluble in cuprammonium hydroxide and 72% sulphuric acid. The non-cellulosic constituent accumulates in the interstices of the more porous lamellae, thus showing a distribution in the secondary wall similar to that of lignin in coniferous tracheids."—Author's summary.

246. MORRISON, J. L., CAMPBELL, W. B., and MAASS, O. The heats of wetting of cellulose by alcohols and their aqueous solutions. Canad. J. Res. Sect. B, Chem. Sci. 15: 447-456; Nov. 1937. 330.9 C16C

"The heats of wetting of dry cotton cellulose by several pure and aq. alcs. were measured for the first time. The rate at which the wetting occurred was also detd. The results indicate a preferential sorption of water from the aq. alc. solns. This conclusion is supported by similar measurements in expts. in which abs. alcs. were allowed to wet cellulose contg. various quantities of previously adsorbed water. The heats of wetting in cals. per g. dry cellulose were 7.07 for MeOH, 0.71 for EtOH, 0.59 for iso-PrOH and 0.16 for n-PrOH and for 50% H_2O-alc. solns. 8.50, 8.27, 8.69 and 9.37 cals., resp. A previous detn. for the heat of wetting using H_2O was 10.16 cals. per g. cellulose. The affinity of H_2O and MeOH for cellulose is of the same order of magnitude but becomes very much less for the higher alcs."—Chem. Abs. 32: 1558.

247.*OGURI, S., and NAKAOKA, T. [Change of temperature of cellulose by the sorption of water vapor.] Waseda Applied Chem. Soc. Bul. [Tokyo. Waseda University] 32: 1-8 (in English, 51) 1937.

"Samples showed a max. temp. in 60 to 90 sec., although the sorption of water at these times was only 1/3 of the total sorption and the temp. of cellulose was decreased afterward."—Chem. Abs. 31: 7247.

248. REMUTH, H., and KÖHLER, W. Der histologische aufbau der baumwollfaser im mikrobild und das verhalten der baumwollcuticula in der beuche und bleiche. Klepzig's Textil-Ztschr. 40: 401-404. 1937.

"Ten photomicrographs are shown and the effects of alk. treatment and bleaching upon cotton are discussed."—Chem. Abs. 31: 6470.

249. ROZENBROEK, M. D. De beteekenis van den tijdsfactor bij de bevochtiging van textielvezels en weefsels hiervan. Chem. Weekbl. 34: 708-716. 1937. 385 C42

"Methods for detn. of the wetting time of threads and tissues are discussed. New methods are: (1) Hang 2 beads on the end of the thread, suspend it in liquid and time the no. of rotations in 5, 10, up to 30 sec. (2) Suspend the tissue on a torsion balance and immerse; it becomes heavier while it wets. This method can be combined with the Servo-Schopper contraction method. Several empirical relations between contraction k and time t of the general type $k = f \log t + g \log c + F$ with f, g, F consts., c conc., are given. Factors involved are enumerated. Wetting substances are heteropolar; they carry a hydrophilic and a hydrophobic group. Either one can be improved, e.g., the former by using sulfonic acid groups. The hydrophobic group can be improved likewise: olein and laurine cause moistening of raw as well as extd. cotton, elaidin only moistens extd. cotton. Ricinolic acid butyrate soaps are good moistening agents, also the ricinolic ether, as well as sulfobutyric ester of ricinolic acid. Side branches have an advantage because the mol. is in contact with the boundary layer in more than one spot. Addn. of electrolytes may raise the moistening effect by driving the agent to the boundary. The surface-tension effect is directly related to the tendency of the capillaries of the fibers to fill up and often takes place at a rate differing from the swelling of the micella. There is a functional relation between wt. increase at const. degree of swelling and the relative surface tension; the swelling tends to enlarge the capillaries and creates a more complex relationship. Some 18 other factors are furthermore involved."—Chem. Abs. 32: 6065.

250. RUSSELL, J. K., MAAS, O., and CAMPBELL, W. B. Sorption of water and alcohol vapors by cellulose. Canad. J. Res. Sect. B, Chem. Sci. 15: 13-37. Jan. 1937. 330.9 C16C

"The amount of water vapour sorbed by beaten and unbeaten samples of kraft unbleached sulphite and bleached sulphite wood pulps at relative vapour pressures ranging from 0 to 100% was determined, and the results indicated that beating caused no change in the hydration of the cellulose. After previous wetting with water and drying, values were obtained for the sorption of methyl alcohol vapour by bleached sulphite, kraft and groundwood, and of sorption of propyl alcohol vapour by bleached sulphite and cotton. The alcohol was not entirely removed by subsequent evacuation at room temperatures. Bleached sulphite and cotton dehydrated by washing with propyl alcohol, gave less residual alcohol after evacuation and the shape of the curve differed from the above. Cotton dried over P_2O_5 in vacuo for a long period, held 0.35% of water by weight, which was removable by heating at 100° C., and regained from the pentoxide on cooling. The hypothesis is enunciated that the crystalline submicroscopic elements of the cellulose structure are drawn together by internal forces during the evaporation of the sorbed liquid, the bonding possibly taking place by the growing together of the crystal elements, leaving the internal structure stressed. On absorption, dissolution of the bonds occurs and the stresses are relieved."—Sci. Abs. 1398 (1937).

251. SAKURADA, I., and OKAMURA, S. Untersuchung der molekülverbindungen der zellulose durch bestimmung des scheinbaren spezifischen volumens und röntgenographische ermittelung des kristallographischen elementar-körpers der gequollenen zellulose. Kolloid Ztschr. 81: 199-208. 1937. 384 Z315

"An expression is derived relating the wt. of H_2O or aq. solution taken up by 1 g. of cellulose with the experimentally determined d of the swollen cellulose and of the liquid used, and the vol. of the unit cell of the former as found by X-ray measurements. These quantities have been determined for cellulose swollen in H_2O, aq. NaOH, N_2H_4, HNO_3, and $HClO_4$, and the following compositions are deduced:
H_2O-cellulose (cf. A., 1937, I, 80), $C_6H_{10}O_5$, H_2O;
Na-cellulose I, $C_6H_{10}O_5$, NaOH, $3H_2O$;
Na-cellulose II, $C_6H_{10}O_5$, NaOH, H_2O;
Na-cellulose IV, $C_6H_{10}O_5$, 0.3NaOH, H_2O;
hydrazine-cellulose, $C_6H_{10}O_5$, N_2H_4, H_2O;
Knecht's compound, $C_6H_{10}O_5$, HNO_3, H_2O;
perchloric acid cellulose, $2C_6H_{10}O_5$, $HClO_4$, $2H_2O$."—Brit. Chem. Abs. A., I. 1938: 29.

252. SEBORG, C. O. Hysteresis in water sorption by papermaking materials. Indus. and Engin. Chem., Indus. Ed. 29: 169-172. 1937. 381 J825

"Repeated sorption cycles over a range of relative humidity from 0 to 95% gave a const. hysteresis curve, if the initial desorption values were disregarded. The ratio of adsorption and desorption values at corresponding equil. points over a range from 12 to 88%, and with a wide variety of pulps and stuffs, is apparently a const. which is slightly higher for lignins, kapok and wood. This hysteresis const. is believed assocd. with some phys. or mol. characteristic of the cellulose mol. connected with the mechanism of sorption. The theory that the sorption hysteresis can be attributed to the difference in the no. of OH groups available for attachment of water mols. appears inadequate and the assertion made that an adequate explanation should include the consideration of addnl. factors of a phys. nature."—Chem. Abs. 31: 8190.

253. SHAPOSHNIKOV, V. G. [Reversibility of the process of moistening and drying fibers under atmospheric conditions.] Akademiia Nauk U.R.S.R., Kiev. Institut Khemichnoi Tekhnologii Zbirnik. No. 3, p. 119-140 (in English, 140). 1937.

"Observations on the moisture absorption and desorption of vegetable, animal and artificial fibres, extending over several months, are said not to give any evidence of hysteresis."—Chem. Abs. 31: 8204.

254. SHAPOSHNIKOV, V. G., and LEPETOV, V. A. [Sorption processes during moistening and drying of cellulose fibers.] Akademiia Nauk U.R.S.R., Kiev. Institut Khemichnoi Tekhnologii Zbirnik. No. 5, p. 89-121 (in English, 117-121) 1937.

"Air-dried natural and mercerized cotton and artificial cellulose fibers were completely satd. with water vapor. After complete satn. they had 13.69, 20.54 and 24.95% water compared with an original moisture content of 6.8,

254. SHAPOSHNIKOV, V. G. (Cont.)
9.78 and 12.60%, resp. The time required for complete satn. was 167.5, 185.5 and 220.0 hrs., resp. The sorption processes follow a parabolic curve. The intensity of adsorption is the same for mercerized and artificial types." —Chem. Abs. 32: 5634.

255. SHAPOSHNIKOV, V. G., and LUGANOV, B. K. [Effect of atmospheric conditions on the moisture content of cotton.] Akademiia Nauk U.R.S.R., Kiev. Institut Khemichnoi Tekhnologii. Zbirnik. No. 5, p. 23-57 (in English, 47) 1937.

"The dependence of cotton-fiber moisture upon the various atm. conditions in different localities of the Soviet Union was detd. Methods for regulating the moisture content in cotton fibers during storage are given."—Chem. Abs. 32: 5635.

256. SHIPLEY, J. H., CAMPBELL, W. B., and MAASS, O. The heat content of water sorbed on cellulose. Canad. J. Res. Sect. B, Chem. Sci. 15: 224-228. May 1937. 330.9 C16C

"The sp. heat of cellulose has been detd. for the temp. range -70° to 25°. The heat capacity of water sorbed to the extent of 5.92 and 12.0% by cellulose has been detd. for the range -78.5° to 25°. These data are compared with the heat capacity of pure H_2O for the same range of temp., viz., -78.5° to 25°."—Chem. Abs. 31: 5155.

257. STAMM, A. J., and HANSEN, L. A. The bonding force of cellulosic materials for water (from specific volume and thermal data). J. Phys. Chem. 41: 1007-1016. 1937. 381 J822

"Measurements of the density of wood substance, cellulose and lignin, have been made in He, H_2O and C_6H_6. The He values, which appear to represent the true densities, when combined with previously detd. values of the densities of the materials contg. varying amts. of adsorbed H_2O, detd. in C_6H_6, make it possible to calc. the compression occurring in the adsorbed H_2O and, consequently, the internal or intrinsic pressure change. To meet the objection of those who believe that He does not completely penetrate the voids of wood and cellulose and thus does not give true d. values, the problem has also been approached from a thermal standpoint. A simple proportionality was found to hold between the heat of soln. and the internal pressure change for exothermic aq. soln. systems in which the true densities can be definitely detd. When the proportionality const. is applied to the wood-water and cellulose-water systems, internal pressure changes of the adsorbed H_2O in good agreement with the values calcd. from the ds. are obtained. The calcns. indicate that initially adsorbed H_2O is held by the wood, cotton and sulfite pulp with a force of about 26 kilobars or about twice the force with which water holds water. The surface-bound H_2O (3 to 6%) is held with an av. force of about 22.5 kilobars. The av. forces with which all of the H_2O below the fiber-satn. point is held by wood, pulp and cotton are about 15.5, 14.7 and 13.5 kilobars, resp., or 24, 17 and 8% greater than the force with which water holds water."—Chem. Abs. 32: 765.

258. WALKER, F. The effect of surrounding media on cellulose. 65, 14, 6 p., typewritten. Montreal, Quebec. 1937. Thesis (PH.D) - McGill University.

"Adsorption and desorption isotherms for water on standard cellulose were measured at two different temperatures, the heats of absorption and desorption calculated and found to be in qualitative agreement with previously measured heats of wetting as determined in an adiabatic calorimeter. It was definitely proved that the hysteresis which occurs in the adsorption and desorption of water by cellulose is not affected by the pressure of residual permanent gases. The apparent density of water absorbed on standard cellulose at various concentrations was determined with a higher degree of accuracy than had been previously obtained, by employing a modification of the apparatus used by other investigators. The rate of moisture adsorption by paper under various conditions of relative vapor-pressure and temperature was measured both in the presence and absence of air. The method used was more sensitive than any previously employed. The conditioning effect of a high humidity on the dimensional change of paper with relative vapor-pressure was investigated, as well as the effect of temperature on these changes."-Author's summary.

259. WALKER, F., CAMPBELL, W., and MAASS, O. Hysteresis of water vapor on cellulose: influence of air. Canad. J. Res. Sect. B, Chem. Sci. 15: 340-344. Aug. 1937. 330.9 C16C

"The amt. of H_2O sorbed from vapor by cellulose which had been previously dried was compared with that retained in equil. with the same atm. by the same sample after having been satd. The difference between the 2 values was const. within the limits 10^{-2} to 10^{-5} mm. air pressure regardless of the presence of air."-Chem. Abs. 31, 8916.

260. WELTZIEN, W., and FAUST, C. Die messung der längsquellung von zellwollen (2. Mitteilung). Monatsh. f. Seide u. Kunstseide 42: 481-486, 488. 1937.

"Various types of staple rayons were examd. for longitudinal swelling on exposure to dry air, water, dry air, water, 6% Na OH by vol., dil. AcOH, water, dry air, water, dry air. The change in length during the immersion in NaOH varies greatly but is very characteristic for different types of staple rayon. With staple rayon a considerable increase in length takes place, while viscose staple rayons may either increase or decrease in length. Numerous swelling diagrams are presented. Titer deviations and deviations of the longitudinal swelling are completely independent of another. Longitudinal swelling is closely related to elongation and dyeing properties."-Chem. Abs. 32: 1463.

261. ANDERSON, D. B., and KERR, T. Growth and structure of cotton fiber. Indus. and Engin. Chem., Indus. Ed. 30: 48-54. Jan. 1938. 381 J825

"The microscopic structure of the cotton fiber and its development from the beginning of growth are discussed in great detail with the aid of photomicrographs. Conclusion: The micellar hypothesis offers a more satisfactory explanation of the phys. properties assocd. with cotton fibers than the ellipsoidal particle hypothesis recently advanced by Farr and co-workers."-Chem. Abs. 32: 1756

262. BAILEY, I. W. Cell wall structure of higher plants. Indus. and Engin. Chem., Indus. Ed. 30: 40-47. 1938. 381 J825

"A comprehensive discussion with photomicrographs. B. concludes that the cell-wall structures are extraordinarily complex and that they exhibit a much wider range of microscopically visible structural diversity and variability than is generally recognized."-Chem. Abs. 32: 1756.

263. CHAMPETIER, G., and VIALLARD, R. Réaction d'échange de la cellulose et de l'eau lourde. Hydratation de la cellulose. Soc. Chim. de France. Bul. Mém. (Série 5) 5: 1042-1048. 1938. 383 P21B

"Samples of ashless filter paper and of ordinary and mercerized cotton linters were dried at 120° in vacuo over P_2O_5 and immersed under D_2O in one leg of an inverted U-tube. At intervals the liquid was distd. into the second leg and its H_2O content detd. densimetrically. The exchange reaction corresponds to $C_6H_7O_2(OH)_3 + 3D_2O = C_6H_7O_2(OD)_3 + 3DOH$. Measured at 30° it is complete in 18 to 36 hrs., at 100° in 13 hrs. Conclusion: D_2O, and hence H_2O, penetrate throughout the mass of cellulose, including the cryst. micelles, and are not restricted to areas of surface adsorption."—Chem. Abs. 32: 8767.

264. FREY-WYSSLING, A. Submikroskopische struktur und mazerationsbilder nativer cellulosefasern. Papier Fabrik. 36(Tech. Teil): 212-217. 1938. 302.8 P197

"Their submicroscopical structure consists of anastomosing rods or microfibrils with a chain lattice of cellulose molecules. The homogeneous parts of this lattice correspond to the micellae of Nageli; these are however not independent, but knit together by chain-molecules. The intermicellular system is heterocapillary. It is composed of minute fissures only accessible to swelling agents, and of coarser bored capillary tubes, where colloidal dyestuffs (e.g. Congo-red) can intrude. Maceration consists on the one side in separating the microfibrils longitudinally from each other by physico-chemical forces and on the other hand in hydrolysing them transversally. Hydrolysis proceeds along predestinated planes of the chain lattice (planes of hydrolysis)."-Author's abstract.

265. GAVORET, J. G. Adsorption et gonflement de l'oc- cellulose. [Paris] Acad. des Sci. Compt. Rend. 207: 65-66. 1938. 505 P21

"α-Cellulose, whether produced from cotton or wood, examd. by the method of elec. cond., shows a threshold of adsorption at pH 4.5. For higher pH the relative increase in initial resistance of a buffer soln. after passage over the α-cellulose increases rapidly and is accompanied by a marked diminution in pH. This indicates adsorption of the cation as hydroxide; also that α-cellulose does not appear to undergo any swelling in H_2O variable with pH." -Chem. Abs. 32: 8769.

266. GAVORET, J. G. Point isoélectrique de la cellulose. Adsorption et gonflement. [Paris] Acad. des Sci. Compt. Rend. 206: 1299-1300. 1938. 505 P21

"The cond. of a series of buffered solns. of pH 1.4-6.8 was measured for a. c. of 110 v. and a few ma. without and with a const. wt. of cellulose (purified cotton) placed between the Pt electrodes. The increase in resistance near the isoelec. point in the presence of cotton due to min. swelling thereof at the isoelec. point, and adsorption thereat of both anions and cations to the exclusion of H_2O, with consequent decrease in content of electrolyte, was greatest for pH 2.6, indicating pH 2.6 as the isoelec. point."-Chem. Abs. 32: 4859.

267. GOLDTHWAIT, C. F. Suggestive observations on the wetting, mercerization and dyeing of cellulose. Part I. Amer. Dyestuff Rptr. 27: P70-P76. 1938. 306.8 Am3

"Observations are noted on processing cotton. Instances of the differential wetting of cellulose and the effects on dye absorption, the wetting of cotton goods and the swelling of cotton by NaOH soln. were studied. Cellulose wetted in a limited manner appears to remain less wet upon subsequent dipping in water than the original air-dry cellulose when similarly dipped. The water of limited wetting must act in some way with impurities or air to cause the resistance to further wetting. There may be orientation of both adsorbed water and impurities and a consequent tendency to protect the cellulose from further wetting by liquid water. At lower temps. the water is held in the cotton more firmly than by mere entanglement. The cotton at the lower temps. may be swollen more and therefore hold its water more readily. Unmercerized yarn holds much more water than the mercerized yarn."-Chem. Abs. 32: 2359

268. GOLDTHWAIT, C. F., and MCLEAN, E. R. Suggestive observations on the wetting, mercerization and dyeing of cellulose. Part II. Amer. Dyestuff Rptr. 27: P76-P78. 1938. 306.8 Am3

"The effect of temp. on the retention of water by cotton, and the effect of dye mixing on shades are studied. A few expts. show that the method of mixing direct dyes may have a great influence on the shade produced."-Chem. Abs. 32: 2359.

269. GOODINGS, A. C. Moisture in relation to textile materials. Canad. Textile J. 55(3): 35-37. Feb. 4, 1938 304.8 C16

"Data are given showing the H_2O-absorptions of wool, cotton, silk and viscose rayon at 20-90%; these are discussed with reference to the manufacture of wool materials under the different climatic conditions of Canada and Great Britain, whereby Canadian-manufactured goods contain 3.5% more wool."-Brit. Chem. Abs. B. 1938: 495.

270. INGRAM, R. V. The swelling of raw and boiled-off silk in relation to width measurement. Textile Res. 9: 79-89. 1938. 304.8 T293

"A split cocoon filament and a single cocoon filament were used for the study of the swelling of raw and boiled-off silk, respectively. The maximum swelling in distilled water was measured and the relationship of the original diameter to maximum swelling was determined. After fixing the silk to a glass slide, under known tension, following a soaking treatment in distilled water, the image of the filament was projected on to a ground glass screen at 500 diameters magnification and measured in microns directly by a transparent scale. Measurements were made in air and in water. The diameters were averaged, and the standard deviations and standard errors calculated. A linear relationship is found between the diameters in air and those of the filaments swollen in water, the correlation coefficients being 0.81 for raw and 0.78 for boiled-off silk."-Textile Inst. J. 30: A338

271. KANAMARU, K., TAKADA, T., and MAEDA, K. Ueber die lyophilen eigenschaften von zellulose und deren derivate, XV. Das ζ-potential der nitrozellulose. [Abs.] Soc. Chem. Indus. [Japan] J. (Sup. binding) 41: 153B-159B. May 1938. J385 J82

"The ζ-potential of nitrocelluloses' (I) of different N contents (12-13.5%) prepd. from ramie fibers and its temporary change in H_2O, MeOH and EtOH in relation to its swelling capacity are studied. ζ is detd. by the streaming-potential cell and the conductivity method. The results are in agreement with the theories found earlier. It is found that ζ_0, which is the ζ potential of I immediately after the sample is immersed in the liquid, is higher the stronger the swelling capacity of the liquid for I. ζ_∞, which is the limiting value of the ζ-potential, is lower, or $\zeta - \zeta_\infty$ is higher, the larger the degree of swelling of I. I has the O potential in that state in which I is so strongly solvated that the degree of swelling approaches soln."-Chem. Abs. 32: 8766.

272. KOCH, P. A. Faserstoffuntersuchungen bei verfeinerter dunkelfeld beleuchtung. Klepzig's Textil Ztschr. 41: 7-14, 138-142, 226-232, 316-327, 491-498. 1938.

"Methods and app. are described. The improved dark-field illumination method with a Kardioid condenser and Szegvari's Azimut screen shows that within the region of the microscopically detectable structure the textile fibers consist of a minute structure of crystallite or micellar bundles which in the plant fibers constitute the wall structure of the cell and which in the animal fibers show differences in the minute structure. The smallest structural units of the textile fibers, the micelles and crystallites, cannot be recognized generally even with the Kardioid condenser. By this method it is possible to differentiate between the two types of staple rayon Lanusa and Cuprama and to recognize the presence of hydrophobic staple rayons (as compared to untreated textiles); this proves the heretofore only suspected superficial esterification of hydrophobic staple rayons. The method can be used also with advantage for observations of swelling and soln. processes in textile fibers, judging dyeings and detn. of delustering spinning dyeings of rayons and staple rayons."-Chem. Abs. 33: 1501.

273. MATSUNAGA, Y. On the densities of various fibres and the widths of the intermicellar spaces. Kyoto. Univ. Col. Sci. Mem. Ser. A. 21: 219-232. 1938.

"The ds. of wool, silk, ramie, cotton wool, and viscose rayon were measured in water, alcs. (Me to n-Am) and liquid paraffin. The ds. were greatest in MeOH and decreased with the increasing C chain. The mols. of the alcs. penetrate into the intermicellar spaces to different degrees according to the chain length of the alc. mols. This indicates the proportion of the intermicellar spaces having different widths."-Chem. Abs. 33: 6686.

274. MOORE, J. H. Measuring the diameter of the cotton fiber. Amer. Soc. Agron. J. 30: 604-609. 1938. 4 Am34P

"Diameters of uncollapsed and mercerised hairs from seven strains of American Upland cotton were measured. The methods are described in the original. The correlation coefficient of the two diameters was 0.95 and the ratio of mercerised to uncollapsed diameter ranged from 0.623 to 0.665, average 0.643."-Textile Inst J. 30: A540.

275. NEIMAN, R. E., and NEIMAN, O. V. O primenenii teorii poli͡ani k svi͡azyvaniiu vody. I. Vychislenie adsorytsionnogo potentsiala po uprugosti para svi͡azannoi vody. Kolloidnyĭ Zhurnal 4: 3-11. 1938. 385 K83

"The adsorption of water by cotton from dilute alcohol (0.024-0.320 mol.) has been measured over the range 0-53° C. The adsorption potential was calculated, on the assumption that the water vapour pressure of the solution is the same as that of the adsorbed layer. The characteristic function e=f(X), where X is the bound water is found to be independent of temperature, in accordance with Polanyi's theory."-Textile Inst. J. 29: A762

276. NEIMAN, R. E., and NEIMAN, O. V. O primenenii teorii poli͡ani k svi͡azyvaniiu vody. 2. Vliia͡nie prirody rastvorennykh veshchestv na svi͡azyvanie vody iz rastvorov. Kolloidnyĭ Zhurnal 4: 13-18. 1938. 385 K83

"Expts. similar to those with EtOH solns. were made with aq. solns. of iso-BuOH, glucose and sugar in concns. of 0.006-0.246 mol. per l. at 19°. The adsorption curves are characteristic of each given solute, but otherwise the results are similar to those for EtOH. Thirteen references."-Chem. Abs. 32: 8236

277. SAKURADA, I., and OKAMURA, S. Vergleich des quellungsgrades der wasser- und hydratcellulose. (Abs.) Soc. Chem. Indus. [Japan] J.(Sup. binding 41): 70B-71B. 1938. J385 J82

"Na-cellulose I washed free of alkali but not dried gives a new fairly sharp x-ray pattern because of penetration of water into the lattice (cf. C. A. 31, 3259) which is termed 'water cellulose' (I) to distinguish it from cellulose hydrate (II). The degree of swelling of I and II prepd. from cotton paper (a), ramie (b) and bandage wadding (c) was compared by soaking in water at 20° for 4 to 8 hrs., drying by handpressing between filter papers and weighing, the degree of swelling being reported as g. H_2O/g. dry cellulose. Statistical averages of about 30 detns. for each material gave the following values: I (a) 1.43, (b) 1.24, (c) 1.23; II (a) 0.96, (b) 0.85, (c) 0.75. The av. differences between I and II and ratios of the swelling degree values were for (a) 0.47 and 1.49, for (b) 0.39 and 1.46, for (c) 0.48 and 1.64, resp., with averages of 0.45 and 1.53. I swells to a much greater degree than II, regardless of the source of the cellulose. The above test values indicate approx. 4 mols. H_2O per $C_6H_{10}O_5$ for I of which only one is contained in the crystal lattice."—Chem. Abs. 32: 8768.

278. SEBORG, C. O., SIMMONDS, F. A., and BAIRD, P. K. Sorption of water vapor by papermaking materials. Irreversible loss of hygroscopicity due to drying. Tech. Assoc. Pulp and Paper Indus., Tech. Assoc. Papers 21: 358-363. 1938. 302.9 T22

"The hygroscopicity of a pulp is definitely increased by extreme beating; for the representative pulps used, this increase, based on the moisture content of the unbeaten pulp, was about 6%. Bleaching lowers the hygroscopicity of a pulp; greatest reduction occurs with slight bleaching; addnl. bleaching, within certain limits, produces a further reduction in hygroscopicity, but the influence is not proportionately as great. The hysteresis of a sorption cycle, after original desorption, between 0 and 95% relative humidity, of a chem. wood pulp was found to remain unchanged through repeated cycles; the ratio of the adsorption to desorption moisture content values, over a wide range of humidities, in these cycles was a const. value, the value of the ratio for the pulps was independent of a species of wood, digestion process, beating and bleaching. Repeated drying and soaking treatments progressively reduced, in decreasing increments, the hygroscopicity of a pulp before and after bleaching above 50% relative humidity until no further reduction in hygroscopicity was observed after the 6th desorption. It is believed that the lower limit of a desorption isotherm of a pulp from above satn. is reached when its hysteresis ratio approaches very near or coincides with that of a closed hysteresis loop which has 0 and 100% as its extremes of relative humidity. The quartz spirals now in use were found to be sensitive to the amts. of moisture they absorb above 65% relative humidity, which necessitated calibration of the spirals at higher humidities and the application of corrections for such adsorbed moisture."—Chem. Abs. 33: 858.

279. STAMM, A. J., and HANSEN, L. A. Surface-bound versus capillary-condensed water in wood. J. Phys. Chem. 42: 209-214. Feb. 1938. 381 J822

"H_2O is selectively adsorbed by wood from aq. sucrose, glycerol, and NaCl. When the lowering of the relative v. p. is 25%, a const. val. of 3% is approached, which is considered to represent the adsorption val. free from capillary condensation and non-equilibrium effects. The difference from the calc. val. (6%) is attributed to the surface-bound H_2O acting as partial solvent."—Brit. Chem. Abs. A, I 1938: 245.

280. WERGIN, W. Strukturelementen der pflanzlichen zellwand. Direkte beobachtung von 0.2 μ grossen. Naturwissenschaften 26: 613. Sept. 16, 1938. 474 N213

"Longitudinal sections of ripe cotton hairs, 5 μ thick, were treated with cuprammonium and caustic soda. Besides the cellular defibrillation of the lamellae, it was possible to discern a partition of the single fibrils into fragments with dimensions about 0.2 μ. It is suggested that the appearance is due to the swelling of a more reactive substance occurring at regular intervals between the fragments."—Textile Inst. J. 30: A540.

281. BAILEY, B., and PHELPS, E. L. The capacitance of textile materials in relation to moisture content. Textile Res. 9: 101-113. 1939. 304.8 T293

"Moisture regain, fiber compn., stage of manuf., and presence of finishing materials all have been shown to influence capacitance of textile materials. Temp., 'previous history' of the textile, arrangement and distribution of the sample in the tube and the ratio of fiber to air in the sample are contributing factors. The use of capacitance measurements as a means of detg. moisture content in the light of these findings would appear to require the control of all but one of the variables. Raw cotton had a higher capacitance than boiled-out fibers. Bleaching appeared to raise capacitance, while mercerization appeared to lower it at regains above 6%. Further purification and modification of cellulose as represented in the rayons, would seem to have lower capacitance to a still greater extent than did mercerization."—Chem. Abs. 33: 2343.

282. *BARKER, S. C. Moisture relationships of jute. 153 p. Calcutta, Indian Jute Mills Assoc. Res. Dept., 1939.

"A comprehensive survey of measurements and data relating to the regain of jute, including descriptions of the majority of methods of measuring regain of textiles. The role of moisture in the attack of micro-organisms upon jute, and the sampling of jute for the commercial evaluation of regain are also discussed."—Textile Inst. J. 30: A240.

283. BARONI, A. Acqua di costituzione e di idratazione delle fibre tessili animali e vegetali. Gaz. Chim. Ital. 69: 435-443. 1939. 385 G25

"Silk (I), wool (II), cotton (III) and rayon (IV) (Bemberg, viscose and acetate) were dehydrated completely by heating the I at 140° and the II, III and IV at 110°, the anhyd. fibers were hydrolyzed at 25° by an air current at various relative humidities and the proportions of water as a function of time were detd. The fibers were then immersed in water in a Dewar thermostat and the increases in temp. measured. This gave the intermediate heats of swelling. The total heats of swelling were detd. by hydrating in a calorimeter the anhyd. fibers in air satd. with water at 30°, and measuring the increases in temp. as a function of the water absorbed. The curves of total swelling were of the same general character as those of intermediate swelling. The curves of the heat of swelling of the animal fibers (I and II) were different from those of the vegetable fibers (III and IV), i. e., whereas the curves of III and IV had relatively continuous trends, the curves of I and II ascended sharply at 1.5 and 2% humidity, resp. This discontinuity is attributable to the presence in the animal fibers of 2 different types of water, viz., water of constitution and water of hydration. Analogous results were obtained by tensimetric examn. of the dehydration of the various fibers. The heat of hydration of the dry fibers diminished rapidly with increase in the water content, and with a water content of 5% the heat of hydration was not over 1/3 of the total heat and with a water content of 10% this heat was only 0.1 of the total. Hence only the 1st part of the water absorbed is responsible for most of the heat evolved. This too indicates the existence of water of constitution and of simple hydration in the animal fibers. The energy expended in the formation of bonds for the water of constitution must represent a quantity of heat greater than that of simple hydration (cf. Champetier, Bull. soc. chim. [5], 5, 577(1938))."—Chem. Abs. 34: 269.

284. FEDOROV, N. S. [The influence of moisture on the strength and extensibility of individual fibers of cotton fabrics.] Khlopchatobumaznaia Promyshlennost 9(12): 23-27. 1939.

"On the basis of exptl. data reported in the literature formulas are developed which show the relation between the strength of the yarn and the relative moisture content for the range 30-70% moisture."—Chem. Abs. 36: 6349.

285. HAAS, H. Die trockentemperaturen - Die trockenzeiten - Das problem der modernen zellwolletrocknung. Kunstseide und Zellwolle 21: 88-90. 1939.

"The structure of cellulose and the effects of drying at high temperatures are discussed, and curves are given showing the decreases in viscosity, breaking strength and extension, and the increases in α-cellulose content, and copper and iodine numbers of cotton with increasing drying temperature. Marked changes are observed at drying temperatures above 100° C., and there is a decrease in strength at temperatures of 120-140° C. Extension at break begins to fall with drying temperatures between 100 and 120° C. whilst a change in dyeing properties is noticed with drying temperatures above 80-100° C. The effects of temperature and time in the drying of wool are briefly discussed, and it is pointed out that the strength of wool after heating for 24 hours at 50° C. is as low as after heating for 1 hour at 85-90° C. Similar results are obtained with cotton. It is pointed out that staple fibre is more sensitive to drying conditions than cotton and drying

285. HAAS, H. (Cont.)
for periods of 1-2 hours at temperatures over 100° C. appears to be unsuitable treatment for such fibres. Attempts to shorten the drying time by using high temperatures or to permit the use of low temperatures by unduly prolonging the period of drying are not to be recommended. Temperature and time of drying should be carefully adjusted to give the best results."—Textile Inst. J. 30: A408.

286. HERMANS, P. H., DE BOOYS, J., and VERMAAS, D. Beiträge zur kenntnis des deformationsmechanismus und der feinstruktur der hydratzellulose. V. Die 'mechanischen eigenschaften' der hydratzellulose. (Ein versuch zur einordnung der mechanischen eigenschaften künstlicher zellulosefäden verschiedenen orientierungsgrades in ein wissenschaftliches system. Kolloid Ztschr. 86: 107-123. 1939. 384 Z315

"Previous studies of the deformation of fibrous substances by H. and by Kratky (C. A. 32, 8243) are reviewed briefly. The fibers were obtained from a tech. ripened viscose soln. contg. 8% cellulose. The fiber vol., oven-dry wt. per m., titer and degree of swelling of the fibers were detd. The fibers were subjected to varying degrees of tension and the values for percentage extension (D) and tension per 100 denier (K) were plotted graphically. It was shown that K-D curves of greatly different form could be obtained with cellulose fibers, depending on the degree of orientation of the fibers in their orig. (unstretched) state. It is thus useless to compare the K-D curves of rayon or similar highly oriented fibers with those of unoriented rubber or wool fibers. The K-D curves of moist unoriented (isotropic) cellulose fibers show similarity to those of rubber and wool. In detg. the 'mech.' properties of various cellulose fibers these have been divided into a 'homologous' series (threads with increasing orientation obtained by increased tension of isotropic fibers prepd. in a definite manner and with a definite state of swelling) and a 'pseudohomologous' series (homologous threads converted into another form with different degrees of swelling). Rayon threads can be considered as higher members of the pseudohomologous series. The strength of fibers prepd. by stretching freshly swollen viscose threads to an air-dry state was of the same order as the strength of the normal tech. viscose thread. The results of these expts. are discussed in relation to the wet and dry strength of the artificial fibers. The general form of the K-D curves for cellulose derivs. is discussed, and a preliminary hypothesis is given for the meaning of the so-called 'yield point' of fibers. Forty references."—Chem. Abs. 33: 2328.

287. HERMANS, P. H., and PLATZEK, P. Das lichtbrechungsvermögen der cellulose in funktion des quellungsgrades. Rec. des Trav. Chim. des Pays-Bas. 58: 1001-1007. Nov. 1939. 385 R24

"The observation made by Meyer and Frey-Wyssling (C. A. 30, 1555) that the n of ramie fibers decreases on swelling in H_2O less than would be expected according to Wiener's theory of mixed substances is reaffirmed by measurements of isotropic fibers of regenerated cellulose for H_2O contents up to 24.4%. In agreement with M. and F.-W. it is concluded that the phys. assumptions of W.'s theory are not fulfilled under all circumstances in the system cellulose-H_2O. Possible explanations for this fact are discussed. With more swollen fibers with a H_2O content of 50% or more, the anomaly ceases, and for such fibers the Newton-Wiener mixt. formula is again valid."—Chem. Abs. 34: 1479.

288. HOUTZ, C. C., and MCLEAN, D. A. Adsorption of water by papers at elevated temperatures. J. Phys. Chem. 43: 309-321. 1939. 381 J822

"Adsorption isotherms for H_2O on tissue papers at temps. from 100° to 150° and equil. H_2O-vapor pressures from 0 to 25 mm. Hg. show considerably higher adsorption on paper from kraft wood pulp than from linen rag. Values of the consts. in the Freundlich adsorption equation, which applies to the data, are given. Hysteresis between adsorption and desorption equil. was found. Paper, dried at temps. higher than the temp. at which adsorption is measured, shows greatly diminished adsorption."—Chem. Abs. 33: 3654.

289. MACMILLAN, W. G. Observations on the swelling of jute fibres. Textile Inst. J. 30: P305-P310. Sept. 1939. 73.9 T31

"A discussion of the swelling properties of jute, including descriptions of methods for measuring swelling. Direct methods include measurement of the fiber diam. using a microscope and micrometer, or the diffraction method; and measurement of the vol. of the fibers before and after swelling. Indirect methods are by weighing and by sp. gr. detn. (M. and Sen, C. A. 33, 7575). Studies of swelling-diam. relationships indicate that swelling diminishes with increase of diam., at first very rapidly, and then more slowly."—Chem. Abs. 34: 2182.

290. MACMILLAN, W. G., and SEN, M. K. Comparative observations on the swelling of jute fibers. I. Textile Inst. J. 30: T73-T82. Apr. 1939. 73.9 T31

"Data are recorded for the swelling of jute fibers in water, alkali, acids, certain commonly used emulsifying agents, and oils (mineral, whale and groundnut). The fibers swelled more in alkali and less in acid than in water. At 100% concn., the swelling effect of all the emulsifiers was small, but in aq. soln. it was considerable. None of the oils produced swelling; groundnut oil contracted the fiber slightly."—Chem. Abs. 33: 7575.

291. NEIMAN, R. S., and KARGIN, V. A. Sorbtsiia vody tsellîuloznymi voloknami. Promyshlennosti Organicheskoĭ Khimii. 6: 628-633. 1939. 385 P94

"Tabulated results of the comparative study of sorption and desorption of water vapors by various cellulosic and casein fibers show that the state of equil. is attained in 2-3 months by the method of Obermiller (C. A. 20, 1143) and in 1-15 hrs. by the vacuum method of McBain (C. A. 28, 391). The 2 methods give nearly equal hysteresis values of the sorption and desorption of viscose. Different specimens of viscose fiber with closely resembling serimetric properties give identical sorption isotherms. Mercerization of cotton and sulfite cellulose increases the relative hygroscopicity. Further chem. treatment in the production of artificial fibers results in a decrease of the fiber chain length and a little change in the adsorptive power to water. Of the artificial fibers cellulose acetate is the least and casein fiber the most hygroscopic materials."—Chem. Abs. 34: 5278.

292. SHIPLEY, J. H., CAMPBELL, W. B., and MAASS, O. The heat content of water adsorbed on cellulose. Canad. J. Res. Sect. B, Chem. Sci. 17: 40-50. 1939. 330.9 C16C

"The heat capacity of H_2O adsorbed on cellulose was measured by means of a new type of adiabatic calorimeter and a new exptl. technique. Measurements were made with 2,4,8, and 12% adsorbed H_2O over the temp. range -35° to +25° with considerable accuracy. A mechanism, that of a change in the amt. of bound water with the temp., is suggested to explain the high values obtained for the apparent sp. heats of adsorbed H_2O."—Chem. Abs. 33: 3672.

293. SISSON, W. A., and SANER, W. R. An X-ray diffraction study of the swelling action of several quaternary ammonium hydroxides on cellulose fibers. J. Phys. Chem. 43: 687-699. 1939. 381 J822

"On treatment with quaternary NH_4 hydroxides both native and mercerised cellulose fibres (a) increase in diameter due to the swelling of intercryst. material, and (b) yield a new X-ray diagram attributed to the formation of a swelling compound between the reagent and the cryst. cellulose. This new diagram appears only above a sp. concn. of the hydroxide employed and is unaltered by increase in the amount of hydroxide added. Data for various hydroxides are given and discussed. The effect of heat on the X-ray patterns depends on the nature of the hydroxide. On washing with dil. acid and H_2O the complex reverts to hydrated cellulose."—Brit. Chem. Abs. A 1939: 418.

294. SKEY, A. J. Measurement of the heats of wetting of cellulosic materials. 109 p., typewritten. Montreal, Quebec, 1939. Thesis PH.D. - McGill University.

"Employing a carefully controlled technique for drying it is found possible to obtain consistent results for the heat of wetting of dry cellulosic materials, even under conditions of high relative humidity. A new and higher value for standard cellulose has been established...The heat of wetting adsorbed moisture content curve lies above the corresponding curve for celluloses containing water left as result of desorption. The difference between the two curves is small. At low concentration they approach one another and meet at zero percent moisture. The relative position of the two curves can be explained as due to the operation of a bonding mechanism between the surfaces of the micelles. Bonding in the case of cellulose containing adsorbed water is less than with a sample containing the same quantity of 'desorbed' water. The heat of wetting of dry cellulose and of cellulose containing ad-

294. SKEY, A. J. (Cont.)
sorbed water increases with a lowering of the temperature. Also the heat of adsorption of 0.04 g. moisture on 1 g. cellulose decreases with rise in temperature. This is considered to lend support of the view that water becomes less bound as the temperature is raised, and also too confirms the contentions that the apparent specific heat of water adsorbed on cellulose is greater than that of free water. The high value of heat of adsorbed water is in apparent contradiction to the conception of bound water; it is believed that the difficulty is merely a matter of definition."—Author's summary.

295. BABBITT, J. D. Observations on the permeability of hygroscopic materials to water vapour. I. Observations at relative humidities less than 75%. Canad. J. Res. Sect. A, Phys. Sci. 18: 102-121. June 1940. 330.9 C16C

"Exptl. work has shown that for the transpiration of moisture through hygroscopic materials 2 distinct regions of relative humidity can be distinguished: (1) A region below some value between 70 and 80 %where the moisture movement is proportional to the vapor pressure difference, and (2) a region of high relative humidity where the moisture movement is not directly proportional to the vapor pressure. A theory is advanced that these 2 regions correspond to the 2 conditions in which water may be present in a hygroscopic material: (1) the water may be molecularly adsorbed, that is to say, the water is bound by the affinity of the mols. of water for those of the solid on which it is adsorbed; (2) the water may be held in small fissures in the submicroscopic structure of the sorbing material by capillary forces. The mechanism by which the moisture will move through the material would be different in the 2 cases and would result in the distinction between regions of high and of low relative humidity. Measurements are given for fiber boards showing that below 75% relative humidity the resistance of the board to moisture transpiration is proportional to the thickness. The moisture content gradients through fiber board samples were detd. The diffusance through a board in which the moisture content gradient is opposed to the vapor pressure gradient shows that the latter is the important factor, and the detn. of the moisture content gradient indicates that at these low humidities Fick's law is applicable."—Chem. Abs. 34: 5721.

296. BOULTON, J., and MORTON, T. H. The dyeing of cellulosic materials: a review of the physics and chemistry of the dyeing process. Soc. Dyers and Colourist J. 56: 145-159. 1940. 306.9 Sol

"A crit. review of studies of the fundamental processes of the absorption of substantive dyes by cellulose. Certain new data, relating to the imbibition of water by cellulosic fibers and to the kinetics of absorption of dyes by viscose rayon of round cross section and by the natural cellulosic fibers, are recorded. 67 references."—Chem. Abs. 34: 4575.

The following table is quoted from p. 147 of the article:

Imbibition of various forms of cellulose

Material	Imbibition (g. water per 100 g. cellulose)
Viscose rayon and staple fibre, various...	85-105
Viscose sheet.....	circa 120
Cuprammonium rayon.....	circa 90
Cotton, American.....	42
Cotton, American, mercerised loose.....	56
Cotton, American, mercerised with tension	46
Ramie.....	42
Linen.....	46

297. CASSIE, A. B. D., and BAXTER, S. Propagation of temperature changes through textiles in humid atmospheres. III. Experimental verification of theory. Faraday Soc. Trans. 36: 458-465. 1940. 382 F22

"Wool or cotton was packed uniformly between 2 concentric starched linen cylinders and housed in a brass cylinder. Data are obtained for air flowing from the outside in through the sample and out through an exit in its axis which verifies the propagation of temp. changes as deduced above. The formula developed by Henry (C. A. 34, 3560) for the case of diffusion has been verified for cotton."—Chem. Abs. 34: 4277.

298. COHAN, L. H., and MEYER, G. E. The properties of liquids in fine capillaries. I. Surface tension and density. Amer. Chem. Soc. J. 62: 2715-2716. Oct. 1940. 381 Am33J

"The product of surface tension, σ, and the volume V, was obtained by measuring the capillary rise of H_2O and toluene in small capillaries; σ was also measured by measuring the pressure, π, required just to prevent any capillary rise of H_2O and toluene. The radii of the capillaries varied from 14.4μ to 1.9μ. A diagram is given of the app. used. The results indicate that the surface tensions and densities of these liquids do not vary from their normal values within the limit of accuracy of the expts. (±5%)."—Dietz, V. R. Bibliography of solid adsorbents, 1944, 411.

299. GOODINGS, A. C., and TURL, L. H. The density and swelling of silk filaments in relation to moisture content. Textile Inst. J. 31: T69-T80. June 1940. 73.9 T31

"The regain of degummed white Japanese silk was measured at 25° under both adsorption and desorption conditions for relative humidities ranging from dryness to satn. Degumming and purification consisted of immersion for 1 hr. in 1% soap soln. at 98°; rinsing; treatment with 0.6% HCl soln. for 15 min.; rinsing; treatment with 0.6% NH_4OH; rinsing; extn. in a Soxhlet successively with alc., ether and again with alc. Measurements were made on small bundles of yarn hung on a quartz spiral in a closed chamber having controlled relative humidity. The density measurements were made on the same silk (benzene was used) at moisture contents ranging from dryness to satn. The longitudinal swelling of the filaments accompanying moisture absorption was also measured. The lateral swelling was computed from the longitudinal swelling and the vol. swelling was derived from density data. A value of 35.8% regain for satd. silk was deduced from density and swelling data. Similarly, the density of satd. silk was deduced to be 1.283 g. per cc."—Chem. Abs. 35: 3822.

300. GÖTZE, K. Die quellung der zellulose in wasser. In his Kunstseide und zellwolle nach dem viskose-verfahren, p. 180-194. Berlin. Verlag von Julius Springer, 1940. 304 G71

301. KANAMARU, K., and TAKADA, T. Untersuchungen über die oberflächenleitfähigkeit. I. Über die oberflächenleitfähigkeit der cellulose und deren derivate in beziehung zu ihrer lyophilie. Ztschr. f. Phys. Chem. Abs. A: Chem. Thermodynamik, 186: 10-18. 1940. 384 Z37

"The surface cond. and its change with time were detd. in H_2O for standard cellulose, hydrate cellulose (viscose), nitrocelluloses of various N contents, and glass. MeOH and EtOH were also used for the nitrocelluloses. The effect of incomplete and complete drying was detd. for the nitrocelluloses and for glass. Solvation on the surface has a great effect on the surface cond. and its change with time. The results indicate that the surface cond. is due to the dipole double-layer (solvent layer) on the surface as well as to the ion double-layer. The surface cond. of glass is much less than that of the celluloses; that of nitrocellulose is greater than that of cellulose. For nitrocellulose in a given medium the values increase with increasing N content; for a given sample in different mediums the values are in the order H_2O<EtOH <MeOH."—Chem. Abs. 34: 4642.

302. KING, G., and CASSIE, A. B. D. Propagation of temperature changes through textiles in humid atmospheres. I. Rate of absorption of water vapor by wool fibers. Faraday Soc. Trans. 36: 445-453. 1940. 382 F22

"The rate of absorption of water vapor by Australian merino wool was detd. in vacuo. The time necessary to come to equil. with the water vapor is shown to be entirely dependent on the rate of loss of the heat of adsorption. A temp. of 65° was observed in the wool 30 sec. after the introduction of the water vapor; a rise of 30° is not inconsistent with the cooling curve observed. By correcting for the effect of the heat of adsorption it is found that the wool attains equil. in a time less than 15 sec. The form of the regain vs. time curves previously obtained by numerous workers is considered to bear no relation to the structure of the fiber colloids, since the curve obtained was detd. by the external factors of diffusion and rate of heat loss."—Chem. Abs. 34: 4276.

303. KULEV, I. G. [Rontgenographic studies of the swelling capacity of commercial pulps.] Leningrad. Tsentral'nyi Nauch.-Issled. Inst. Bumazhnoi. Promysh. Mater., No. 29-30, p. 82-112. 1940.

"The swelling capacity of cellulosic fibers was studied by the Röntgenospectrographic method of Katz (C. A. 29, 2090) in the Debye-Scherrer X-ray app. In all, 18 kinds of fiber, including native ramie and bleached and unbleached sulfite and sulfate pulps of different degree of hardness, were tested. Cut strips (0.01 g.) were treated in 4 ml. of 11.5 and 12% NaOH at 17-18° for 20 min., the swollen fibers were washed with water and 1% AcOH

303. KULEV, I. G. (Cont.)
and, after rinsing with water, pressing and drying in air, were examd. The tabulated results show that, in agreement with the literature data (cf. Hess and Trogus, C. A. 25, 2282), the diagrams of swelling vary with different fibers (com. pulps). The abs. value of swelling shows no relation to other consts. of the pulps tested. Bleaching and beating increase the degree of swelling. The application of the method in the control of pulp and paper production requires further development."—Chem. Abs. 34: 8270.

304. MITCHELL, J., Jr. Determination of moisture in native and processed cellulose. Titrimetric determination using Karl Fischer reagent. Indus. and Engin. Chem., Analyt. Ed. 12: 390-391. 1940. 381 J825

"For regenerated cellulose and paper, a sample contg. 50-250 mg. H_2O is weighed into a glass-stoppered flask contg. 100 ml. dry MeOH. After standing 1 hr. the mixt. is titrated directly with Karl Fischer reagent, consisting of a mixt. of I_2, pyridine and SO_2 in MeOH soln. (Smith, Bryant and Mitchell, C. A. 33, 8524). Woods require 2 extns. with MeOH. Recovery of H_2O is more nearly complete than by the oven-drying technique."—Chem. Abs. 34: 6063.

305. MORRISON, J. L., CAMPBELL, W. B., and MAASS, O. The heats of adsorption and wetting of mercerized celluloses by sodium hydroxide solutions, water and methyl alcohol. Canad. J. Res. Sect. B, Chem. Sci. 18: 168-179. June 1940. 330.9 C16C

"The heats of adsorption and wetting by aq. NaOH water and CH_3OH were detd. for celluloses mercerized at several different alkali concns. A quantity named the 'heat of mercerization' has been detd., and it is considered to be a measure of the irreversible effects that distinguish mercerized from standard cotton cellulose, such as changed crystal lattice and enhanced internal surface. The extent of the latter change for the various mercerized celluloses has been shown by the heat of wetting measurements with H_2O and CH_3OH."—Chem. Abs. 34: 6064.

306. PFLEIDERER, K., WERTEL, W., and NEUHAUS, I.-H. Die hydrophobierung von zellwollgeweben. Melliand Textile Ber. 21: 641-647. 1940. 304.8 T312

"Hydrophobing processes, sometimes referred to as chem. shrinking, depend on blocking the hydroxyl groups of cellulose; this reduces the tendency to swell in H_2O. Samples of spun rayon with 8 different types of finish were subjected to repeated severe washings and subsequently tested for (1) resistance to abrasion, (2) shrinkage, (3) tear resistance, (4) H_2O repellancy, (5) feel and appearance, (6) crease resistance, (7) resistance to ironing, (8) microscopic evidence of damage. Hydrophobing has no material effect in reducing ultimate shrinkage. Resistance to abrasion and tear is lessened. Hydrophobing gives a definite mech. protection to the fiber in the wet state, which reduces the tendency to fray and split. It increases the tendency for H_2O to penetrate the weave, and should be used in conjunction with impregnation to obtain waterproof fabrics."—Chem. Abs. 35: 4214.

307. SHAPOSHNIKOV, V. G. O sorbtsionnykh svoistvakh tselliulozy. Akademiia Nauk. S.S.S.R., Leningrad. Izvestiia S.7 Otdelenie khimicheskikh nauk. 1940: 427-445, (in English, 446).

"The sorption properties of mercerized cotton, natural Egyptian cotton and rayon were investigated. From the natural cotton, impurities were removed by extg. in turn with water, alc. and ether; this leaves a sample with about 0.1% ash. The method of mercerization consisted in stirring 10 g. cotton in 600 cc. pure 30^0 Bé. NaOH for 4 min. and 4 operations of pressing the sample, washing water and centrifuging to neg. test for NaOH. This leaves about 5% fibers unmercerized, as observed under the microscope. After repeating this operation with a 9-min. treatment and 2-min. washings, the unmercerized fibers amounted to 1%. The artificial fibers were warmed with water to an ash content of 0.06%. Through these samples kept in U-tubes, dry or moist air was passed. The natural air-dried cotton contained 6.8% moisture and when completely satd., 13.69%; mercerized cotton, 9.78 and 20.54%, resp.; rayon, 12.61 and 24.95%. In earlier expts., mercerized cotton was shown to adsorb 40% more dye than purified natural cotton. Mercerization results in swelling and loosening of the fiber, increasing its surface and adsorption properties 1.5 times. Water vapor is adsorbed more than liquid water. Complete satn. of air-dried natural cotton with moisture required 167.5 hrs.; mercerized cotton, 185.5 hrs.; rayon, 220.0 hrs. The sorption processes do not proceed uniformly, but are gradually retarded, as shown by graphically reported data. Mercerized cotton and rayon show a similar rate of adsorption, but natural cotton has a considerably higher rate. Upon regeneration from soln., cellulose takes up moisture comparatively uniformly. Normal moisture content of 8 types of fibers, including cotton, silk, flax and wool, in the neighborhood of Kiev is on the av. 2% higher than that required by the specifications established at Turin in 1874. Diagrams show that it seasonally fluctuates around the av. of 13.56%, the lowest figures being observed for May and June and the highest for December and January. An attempt is made mathematically to express this fluctuation for the climate under observation."—Chem. Abs. 35: 8301.

308. WALKER, A. C. Three years of textile drying research. Textile Res. 10: 443-445, 461. 1940. 304.8 T293

"A brief report is given of results obtained in a three-year study of the drying of textiles carried out by the United States Institute for Textile Research. The work included investigations of the moisture-relative humidity-temperature relations of textiles, the effects of heat and humidity during drying upon the properties of purified textiles, and the effects of certain added impurities, such as sizing and carbonizing agents, upon the properties of treated textiles after exposure to definite conditions of heat and humidity during drying."—Textile Inst. J. 32: A10.

309. WELTZIEN, W., FAUST C., and PHYRR, E. Der bau der kunstseiden und zellwollen und ihre textilen eigenschaften. II. Mitt.: Die quellung quer zur faserachse (dickenquellung) Zellwolle, Kunstseide, Seidel 45: 149-154, 186-190. 1940.

"Methods of detg. the extent of the swelling without pretreatment as well as after pretreatments with NaOH soln. and washing with 10% Na_2SO_4 soln. are described. Synthetic textiles of similar origin frequently behave similarly on swelling, while fibers of different origin or which had been subjected to completely different manufg. operations show distinct differences. Thus, acid-spun viscose fibers and alkali-spun Cu fibers act differently; in moist atm. Cu fibers swell less than viscose fibers while the reverse is true for swelling these fibers in water; an alk. pretreatment affects the swelling of Cu fibers in water usually only slightly. Some viscose fibers are influenced greatly in their swelling properties by treatment with alkalies while others are hardly affected at all. Not only the degree of polymerization, alk. soly., etc., but also the inner structure together with the fiber mechanism, influences the swelling phenomenon. Photomicrographs are shown."—Chem. Abs. 35: 906.

310. WHISTLER, R. L., MARTIN, A. R., and HARRIS, M. Pectic substance in cotton and its relation to the properties of the fibre. Textile Res. 10: 269-279. 1940. 304.8 T293

"A new method permits the accurate detn. of small amts. of uronic acids in the presence of large proportions of cellulose. The present investigation deals with state of pectic substance in native cotton fibers, its ease of removal by various reagents, its behavior in cuprammonium hydroxide solns. and its influence on the textile strength and on the viscosity of cuprammonium dispersions of the cotton. The results indicate that a pectin-cellulose complex does not exist in cotton fibers and that the pectic substance is present as an insol. salt. The replacement of these ions, under hydrolytic conditions, by the monovalent cations, Na or NH_4, renders the pectic substance sol. Cotton freed from pectic substance with alkali shows no change in tensile strength, or in η, whereas treatment of the fiber with acids, which removed only a small proportion of the pectic substance, produced an appreciable lowering of these properties. When dewaxed fibers were dispersed in cuprammonium solns. a small proportion remained insol. and was sepd. in a centrifuge. This insol. material consisted almost entirely of pectic substance. Fibers pretreated with concd. HCl showed similar results. Apparently the pectic substance does not contribute to the η of cuprammonium dispersions of cotton. 23 references. Also in J. Research Natl. Bur. Standards 24, No. 5, 555-65 (1940) (Research Paper No. 1299)."—Chem. Abs. 34: 4581.

311. WIEGERINK, J. G. The moisture relations of textile fibres at elevated temperatures. Textile Res. 10: 357-371. 1940. 304.8 T293

"The moisture contents of 10 kinds of textile fibers in the form of specially prepd. yarns were detd. when the fibers were in equil. with air for a series of relative humidities and temps. Data were obtained for 'desorption' and 'adsorption' with the yarns brought to equil. from a wet condition and a dry condition, resp. Raw cotton, 'purified' cotton, mercerized cotton, clothing wool, carpet wool, viscose rayon, cuprammonium rayon, raw silk, degummed silk and cellulose acetate were tested. The temps. ranged from 35° to 150° and relative humidities from 5% to 90% for temps. below 100° and up to the max. obtainable at atm. pressures above 100°. Graphs show results of moisture content against relative humidity and others give the log of the moisture contents at given relative humidities plotted against the reciprocals of the corresponding abs. temps. The last show straightline relationships with changes in the slopes of the lines between 93° and 104°. Above 30% relative humidity the slope of the linear relation changes very little with increasing humidity, in the range between 38° and 93°. Below 30% relative humidity the slope increases appreciably with decreasing humidity. Above 93° the slopes change for all relative humidities investigated up to 50%."—Chem. Abs. 34: 6081.

312. HEERTJES, P. M. The density and sorptive capacity of some samples of cotton, silk and wool. Part III. Determinations on Egyptian cotton. Rec. des Trav. Chim. des Pays Bas. 60: 689-699. 1941. 385 R24

"Values are given for the d. of mercerized cotton, dyed and undyed, in H, He, and air, as well as the apparent d. in air, H, water and benzene. From these experiments it can be det. that with cotton dyed with substantive dyes, the cotton substance is unchanged and the dye is between the micelles. Air and H are absorbed by cotton. The amt. of absorbed gas is not affected by the dyeing operation. Consideration is given to the phenomenon of dyeing as related to the development of the surface and hydrophilic nature of the textile fibers, and also as affected by the specific behavior of the dyestuff, (i.e. whether the dye dissolves in the fiber, reacts with the fiber, or is absorbed in the fiber)."—Chem. Abs. 37: 1275.

313. *HERMANS, P. H. [Mechanism of deformation and swelling of cellulose gels.] Kolloid Ztschr. 96: 311-326. 1941. 384 Z315

"Previous work on this subject is reviewed. In the interpretation of the properties of cellulose in terms of a model, the micellar as well as the fine structure must be considered. Tension and orientation expts. were carried out on completely isotropic fibers obtained by pptn. of a viscose soln. without stretching. Such fibers are tough and capable of extension to more than 100%. The fibers become anisotropic upon extension, as shown by optical means and through swelling measurements. To obtain a definite degree of orientation, much less stretching is required of the fiber in a highly swollen state than in the dry state. Freshly prepd., swollen fibers contain but little cryst. material. The crystallinity decreases on drying, and especially on stretching."—Chem. Abs. 36: 7303.

314. HOUTZ, C. C., and MCLEAN, D. A. Heat of adsorption of water by papers. J. Phys. Chem. 45: 111-127. 1941. 381 J822

"With app. previously described (cf. C. A. 33: 3654) the adsorption of water vapor was measured in the pressure range 0 to 25 mm. and the temp. range 100° to 150° on 2 types of cellulose tissue, one of linen derivation and the other of kraft wood pulp, both having been stabilized by sufficient initial heating at 150°... A final reproducible adsorption being obtained that was nearly the same for the 2 papers. Heats of adsorption calcd. from the isotherms are approx. the same on the two materials, varying from about 16 kg. cal. per mol. of H_2O for the 1st amt. of water vapor adsorbed to a value of about 14 kg.-cals. for an adsorption of 0.35 wt.%."—Chem. Abs. 35: 2404.

315. MACMILLAN, W. G. Comparative observations on the swelling of jute fiber. 2. Specific gravity and swelling. Textile Inst. J. 32: T45-T56. Mar. 1941. 73.9 T31

"The true and apparent specific gravities of dry jute fibers were found to be 1.436 and 1.559, resp. The vol. swelling calcd. from the sp. gr. is 45%. Measurements on cross-sections and on diams. indicate that swelling diminishes with increase of area or diam. of fibers. The effect of temp. and humidity on the dry weight of fibers was investigated. Cf. C. A. 33, 7575."—Chem. Abs. 35: 4957.

316. NEALE, S. M., and STRINGFELLOW, W. A. The primary sorption of water by cotton. Faraday Soc. Trans. 37: 525-532. 1941. 382 F22

"These expts. cover sorptions up to 1.5 mg. H_2O/g. cotton, the latter being identified as 14.0 g. of 28-count 2-fold Sakellaridis yarn which had received a full tech. bleach followed by a wash with dil. NH_3. Examn. showed that it had undergone the min. of degradation. Pressures of H_2O up to 1 mm. Hg were read on a Pt-ribbon-filament Pirani gage at temps. of 20, 30, 40, 50, 60, 70, 80°. The adsorption by the glass walls was corrected for; e. g., at 90° the distribution of H_2O at equil. was 0.22 mg. in vapor state, 0.20 mg. on glass and 2.98 mg. on the cotton. The plot of log p vs. 1/T is linear and from the slope the differential heat of sorption is 15.7 kg.-cal./g. mol. This value is accounted for by each H_2O mol. directly linking in this stage of primary adsorption to a pair of suitably placed cellulose OH groups. The energy per bond (7.85 kg.-cal.) would then be similar to that found for acetic acid (7.8 kg.-cal.) but higher than the values for ice (5.8) and the aliphatic alcs. (6kg.-cal.)."—Chem. Abs. 36: 1228.

317. N. V. CHEMISCHE FABRIEK "SERVO" and ROZENBROCK, M. D. [Treatment for natural fibers.] Dutch Pat., 51,285, Oct. 15, 1941.

"Natural fibers, before being treated in a water bath, are treated with a volatile org. compd. which is alien to the natural fiber and which does not enter into a permanent chem. reaction with it but which has the effect of lowering the rate of swelling of the fiber. This org. compd. may be applied in its vapor state, as a soln. or as an emulsion. Suitable for this purpose are primary, secondary, or tertiary aliphatic, alicyclic, or aromatic satd. or unsatd. alcs.; aldehydes and ketones; halogenated hydrocarbons, volatile and liquid esters and ethers, and the lower fatty acids."—Chem. Abs. 36: 4353.

318. BERKLEY, E. E. Shrinkage and cell-wall structure of cotton fibers. Amer. J. Bot. 29: 416-423. 1942. 450 Am36

"Longitudinal shrinkage of cotton fibers, when dried from the green to the air-dry and oven-dry conditions, was measured on 7 varieties, representing 2 species (Gossypium hirsutum and G. barbadense), collected at frequent intervals beginning 10 days after the flowers opened. At the age of 10 days shrinkage was 35 to 40%. From the 10-day period to the time of secondary thickening the shrinkage gradually decreased. Removal of waxes or pectic substances increased the shrinkage. There was a decrease in shrinkage when the fibers were dewaxed and then treated with boiling 1%NaOH for one hr. Bundles of fibers contg. primary wall only increased in length in 18%NaOH; fibers contg. secondary thickening decreased in length under this treatment. Fibers with primary walls only elongated in cuprammonium soln. but fibers with secondary thickening decreased in length. The results are stated to confirm the microscopic and X-ray studies which show that the cryst. cellulose of the primary wall lies traverse to the long axis of the fiber or in a low spiral around the fiber. They also indicate that only a small percentage of the primary wall is cryst. cellulose."—Chem. Abs. 36: 5021.

319. *CONSTANT, J. Hygroscopic properties of natural, synthetic and mixed textile fibers. Indian Textile J. 59: 281-282. 1942. 304.8 In2

"The hygroscopic properties of various textile fibers and their effects on elongation, thermal cond. and drying are discussed."—Chem. Abs. 38: 4450.

320. HUBERT, E., MATTHES, A., and WEISBROD, K. Die gel-struktur künstlicher fasern aus regenerierter zellulose, I. Kolloid Ztschr. 98: 173-180. 1942. 384 Z315

"Detn. of the structure of synthetic fibers and regenerated cellulose is made with the aid of the centrifuge method, and various phenomena on swelling and shrinkage are investigated. The fiber (0.5 g.) is centrifuged to const. wt. (800 X gravity). The swelling value q is detd. from the difference in wt. between the centrifuged and abs. dry fiber, and q=100 when the centrifuged fiber retains water equal to its own wt. The degree of swelling as affected by Na_2SO_4, other sulfates, and H_2SO_4 in the pptg. bath is detd. The swelling degree has a pronounced min. (q=110-90) at 11-14% H_2SO_4 (according to the amt. of Na_2SO_4). $MgSO_4$ has a particularly strong shrinkage effect (q less than 100); this is followed, in decreasing shrinkage effect, by Na_2SO_4, $(NH_4)_2$-SO_4, $ZnSO_4$, $FeSO_4$ and $Al_2(SO_4)_3$. In an alk. system the shrinking effect of $(NH_4)_2SO_4$ is the strongest. Tensile and compressive stresses have a shrinkage effect. NaOH is a strong

320. HUBERT, E. (Cont.)
swelling agent, particularly at lower temp. (0^{o})and higher concn. (5-10%). Below 5% NaOH has a shrinking effect. KOH has only a shrinking effect. A soln. of 5% NaOH in water-alc.(1:1) has a max. shrinking effect, from q=160 to q=105. NH_4OH has no effect. Drying results in an irreversible lowering of the swelling capacity. On repeated drying and swelling, the swelling capacity sinks to a limiting value of q=60. If the fiber is treated with satd. H_2O vapor, a limiting value is reached where 100 parts of dry cellulose take up 50-5 parts H_2O (q=50-5). The reduction of swelling value through treatment with H_2O vapor is a property of all high mol. wt. org. gels regenerated from solns. or having passed through a high swelling state. Anhydrous NH_3 works similarly to H_2O vapor. By extrapolation of the adsorption isotherm of H_2O vapor on hydrate cellulose a min. q of 50-55 is calcd."—Chem. Abs. 36: 6793.

321. KEATING, J. F., SCOTT, W. M. Volumetric determination of moisture in cotton textiles. Amer. Dyestuff Rptr. 31: P308-P310. 1942. 306.8 Am3

"Data presented in this paper indicate that the moisture regain of cotton textiles can be detd. as accurately and more efficiently by cold extn. with methanol and subsequent titration of the water with Karl Fischer reagent (C. A. 29, 6532), than by drying to const. weight in an oven at 105^{o} to 110^{o}. The titration method saves an appreciable amt. of time over the oven-drying method when it is necessary to make a large no. of moisture detns. daily."—Chem. Abs. 37: 264.

322. RADULESCU, D. Beiträge zur kenntnis der struktur der flüssigkeiten in der kapillarschicht. Kolloid Ztschr. 98: 34-42. 1942. 384 Z315

"A closed vessel contains a given amt., G, of active charcoal satd. with liquid up to the satn. pressure. At const. temp., small amts., a, of vapor are removed and the vapor pressure P_r is detd. The P_r versus a/G plot represents the desorption isotherm of the liquid. Immediately after the wetting, isothermal distn. from the thicker to the narrower capillaries sets in until the smallest capillaries are filled and complete uniformity in the menisci is achieved. Each vapor pressure as measured corresponds therefore to a definite meniscus. Immediately after the formation of the first menisci a discontinuous change of the P_r values by definite amts. is observed, for an integer no. of mols. only can participate in the formation of a capillary meniscus. The menisci change therefore in a stepwise fashion by amts. equal to a mol. diameter."—Dietz, V. R. Bibliography of solid adsorbents, 1944, p. 412.

323. SIMRIL, V. L., and SMITH, S. Sorption of water by cellophane. Indus. and Engin. Chem., Indus. Ed. 34: 226-230. 1942. 381 J825

"Four sorption isotherms at temperatures from 16.5 to 49.5^{o} C. are determined; curves at various equal moisture contents are constructed. The net heat of sorption is not independent of temperature. Variation in shape of the entropy curves for adsorption and desorption points to an essential difference between the two processes. The hysteresis loop is interpreted on the basis of the entropy of the sorbed water. The relation between moisture regain and relative humidity is discussed."—Sci. Abs. Sect. A (Phys.) 45: 1936.

324. *WELTZIEN, W., WINDECK-SCHULZE, K., and PIEPER, J. [The measurement of the absorption of moisture by textiles.] Zellwolle, Kunstseide, Seide 47: 57-67. 1942.

"The purpose of this study was the exact detn. of the dry swelling in relation to relative air humidity and temp. Three methods of detn. are commonly used: (1) measurements in large air-conditioned rooms in which the air is in const. motion, (2) measurements in small vessel in which the atm. is stationary, (3) tests in vacuo in small vessels. The first method, which offers the advantage of the making of detns. on large samples, requires a very accurate functioning of the air-conditioning installation; the third method is only of theoretical interest; the second method was used in these expts. The vessel employed was made of glass; the air was adjusted to the desired humidity by means of H_2SO_4; the sample was contained in an Al wire basket. The wt. of the sample was approx. 1 g. The samples were first degreased with CH_3OH, dried at 85^{o} and washed twice with water. The flask contg. the sample was placed in a vessel used as a thermostat and the basket was suspended on a torsion balance by means of a long wire. After the weighing the sample was dried in vacuo over P_2O_5 and the moisture was calcd. to 100 g. of absolutely dry fibers. A no. of rayons, loose staple rayons and staple-rayon fabrics thus tested yielded values of 13-15% for the absorption of moisture and approx. 1.5% higher values for the emission of moisture at 65% relative atm. humidity and 25^{o}. Repeated washing of the textiles did not change these figures. The moisture absorption values are of greater importance for practical operations."—Chem. Abs. 37: 4254-4255.

325. AIKEN, W. H. Effect of acetylation on water-binding properties of cellulose. Relation between physical properties and hygroscopicity. Indus. and Engin. Chem., Indus. Ed. 35: 1206-1210. 1943. 381 J825

"Sheets prepd. from beaten acetylated rag stock showed max. bursting and tensile strength when 4% of the OH groups were substituted. This corresponds to the max. in hygroscopicity. Maxima were obtained with acetylated wood pulp beaten in water at higher Ac content. Previous observations that the more highly acetylated fibers can be converted into a satisfactory sheet by using acetone as beating and sheet-forming medium were confirmed. Addn. of xylan to unacetylated rag stock increased the phys. strength of sheets. Addn. of acetylated xylan decreased the sheet strength; this indicates that the strength-increasing effect of noncellulosic carbohydrates is brought about by mutual bonding between their OH groups and those of cellulose."—Chem. Abs. 37: 6888.

326. BAXTER, S. Electrical conduction of textiles. Faraday Soc. Trans. 39: 207-214. 1943. 382 F22

"Experimental results on the electrical properties of textile fibres with and without adsorbed water are given. ... The theory that the conductivity of water condensed in the inter-micellar channels does not readily fit the experimental data and a new theory is put forward on the assumption that dry wool is an almost perfect insulator, and that the adsorbed water molecules cause impurity centres giving rise to electronic conduction."—Author's summary.

327. BLETZINGER, J. C. Effect of acetylation on water-binding properties of cellulose. Rag stock. Indus. and Engin. Chem., Indus. Ed. 35: 474-480. 1943. 381 J825

"Rag stock fibers were acetylated (Ac_2O and C_5H_5N) without alk. pretreatment. Viscosity measurements in cuprammonium hydroxide showed that the degree of polymerization of the rag stock cellulose changed very little on acetylation (4.25-26.7%Ac); the greatest decrease was less than 10%. The tensile strength of cotton lint prepd. from raw cotton by extn. with EtOH followed by careful bleaching, increased on acetylation. Samples of rag stock of increasing Ac content were subjected to mere disintegration (defibration) in the British disintegrator and to heating in a specially constructed device. The acetylated material which was merely defibered became increasingly incompatible with water and increasingly resistant to attempts to form a uniform and coherent sheet as the Ac content increased. The phys. strength properties and apparent d. of handsheets decreased with increasing Ac content and became practically O with fibers contg. 24%Ac. These results indicate the ability of cellulose fibers to become hydrated on mech. treatment in the presence of water and subsequently bonded together on the removal of the water to form a sheet of paper is essentially a function of their HO groups. The phys. strength properties of sheets prepd. from beaten samples increased with increasing Ac content, reached a max. at about 6%Ac and then dropped with further increase in Ac content. The phys. properties of sheets prepd. from rag stock which had been regenerated from the acetylated material by sapon. were nearly the same as those of the original material. When acetylated rag stock was defibered or beaten in acetone, sheets of excellent uniformity and even greater strength properties were obtained than from the original material beaten in water; the sheets were also remarkably resistant to the penetration of water and ink. These results are explained on the assumption that, in analogy with the behavior of unacetylated fibers in the presence of water, the acetylated acetone-swollen fibers are solvated by the acetone as beating progresses and are bonded together through secondary valences of their Ac groups as the acetone is allowed to evap."—Chem. Abs. 37: 2928.

328. JAYME, G. Über die reaktionsfähigkeit von zellstoffen. Cellulosechemie 21(4): 73-86. Sept. 1943. 309.8 C33

"An address dealing with the swelling of cellulose in the presence of water, the changes in cellulose on drying, with special reference to fine structure and the cornification (I) of pulps...Heiniger has devised a method for detg. the reactivity of pulps dried in various ways toward water sorption. This is actually a measure of the irreversible I.

328. JAYME, G. (Cont.)

Details of the method have not been published, but it depends on the fact that when moist pulp is introduced into dry dioxane only a portion of its H_2O is taken up by the solvent. This can be accurately measured by detg. the change in dielec. const., which rises about 12% for every 1 of H_2O dissolved."—Chem. Abs. 38: 5398.

329. LAUER, K., and others. Zur kenntnis der cellulosefasern. 1. Mitteilung: Die systeme faser-wasser. J. f. Makromol. Chem. 1(1-6): 76-96. Aug. 1943. 384 J82 A

"The heat of adsorption was detd. for a no. of pulps (I) (including spruce, pine, cereal straws and other plants), viscose rayon and staple fibers from various woods, straws, etc. (II) and ramie, cotton and filter paper (III). III, including certain pulps, gave an av. value of 1.69 (±5%) kg.-cal./mole C_6, $H_{10}O_5$, I gave a value of 2.11 (±10%) and II gave 3.41 (±8%). After extg. the pulps in group I with aq. NaOH (removal of hemicelluloses) (IV), the heats of adsorption were the same as for group III. The extd. IV gave a value of 4.8 kg.-cal./mole $C_6H_{10}O_5$. The heat of adsorption ('heat of solvation') for regenerated cellulose was thus twice that of native cellulose. Calcd. for 1 mole of H_2O, the heat of adsorption was 3.40 kg.-cal. for both types of fibers. This value is very nearly that of the heat of hydration (per mole of H_2O) liberated on the formation of solid sugar hydrates from cyst. B-sugars and liquid H_2O and that of the heat of mixing of EtOH with H_2O. This agreement is in favor of hydrate formation between cellulose and water. This is discussed in terms of the intermicellar distances. The heat of adsorption of mercerized celluloses increased with the time of mercerization with 20% NaOH at 20° (the degree of polymerization was practically unchanged); this increase is explained by an increase in the amorphous portion. Degradation with acids or treatment in an oscillating mill did not change the heats of adsorption of rayon, ramie and wood pulps; likewise, heating in glycol caused no change. In spite of their greater internal surface, the heat of adsorption of isotropic fibers (i.e., showing no elongation) was not higher than that for regenerated fibers (2.38-2.66 as compared with 3.41); fibers prepared by spinning into 60-5% H_2SO_4 have values of 3.08 and 3.40."—Chem. Abs. 38: 1354.

330. POWRIE, A., and SPEAKMAN, J. B. The adsorption of water by jute. Textile Inst. J. 34: T77-T86. Oct. 1943. 73.9 T31

"Eleven samples of jute of known com. quality were analyzed for alc.-benzene-sol. matter, cellulose content, xylan content of the cellulose, furfural yield and lignin content. Each sample was divided into 3 parts—root, middle and tip. Analytical results are referred to dry wts. obtained by drying the jute for 1 hr. in a stream of dry air at 105-110°, since preliminary tests indicated that jute does not undergo significant decompn. under these conditions. The results of analyses show no simple connection between constitution and quality, although the lowest qualities had the highest and lowest contents of lignin and cellulose, resp. Adsorption and desorption isotherms were detd. at 25° on powd. jute prepd. from the middle portions of six of the samples, selected so as to include 2 samples each of white jute of high and low quality, one sample of red jute, and a sample of Hibiscus cannabinus, a jute substitute. The samples for obtaining adsorption data were dried for two weeks in vacuo over P_2O_5 at 25±1°, even though it was found that jute retains about 0.9% water under these conditions. The samples for the desorption expts. were first exposed to distd. water at 25° for 2 to 3 weeks, then to atmospheres of decreasing relative humidity from 90% to 10%, and finally dried over P_2O_5. As for other textile fibers, the adsorption isotherms are all sigmoid in shape, and there is considerable hysteresis between adsorption and desorption isotherms. The different kinds of jute differ considerably in their affinity for water, but it is difficult to correlate the differences with constitution. There is, however, a general tendency for the regain at any particular humidity to increase with increasing xylan+lignin content. As expected, the jute of highest quality shows the lowest affinity for water. Moreover, one of the 2 samples of poor quality had the highest affinity for water, and although the 2nd sample had a much lower affinity than the first, this lower affinity was higher than that of any of the samples of higher quality."—Chem. Abs. 38: 2826.

331. WALKER, A. C. Drying of textiles. Amer. Soc. Mech. Engin. Trans. 65: 329-336. 1943. 291.9 Am3T

"It is seen from the foregoing discussion of recent experimental data on the moisture relations of textiles, and the discussion of the theory of moisture sorption and distribution in cotton and other cellulosic fibers, that it may be highly undesirable to remove all or part of the initial mono-molecular layer of moisture from the internal surfaces of such materials. Too thorough or uneven drying may impair the valuable properties of flexibility, softness, and strength. Therefore, in any problem involving textile drying, consideration should be given to the theories relating to the form in which the moisture is distributed within the fiber structure and to data of the type discussed in this paper."—Author's conclusion.

332. ASSAF, A. G., HAAS, R. H., and PURVES, C. B. A new interpretation of the cellulose-water adsorption isotherm and data concerning the effect of swelling and drying on the colloidal surface of cellulose. Amer. Chem. Soc. J. 66: 66-73. Jan. 1944. 381 Am33J

"Three highly swollen celluloses were subjected to TlOEt and then MeI and finally analysed for OMe. The results, extrapolated to solvents having mol. vol. 18 and 35, give % theoretically accessible to H_2O vapour and N_2 respectively. H_2O-adsorption at 20° and 25° is determined; the final change in direction of the isotherm (at R.H.~50%) occurs at ~1 H_2O per accessible OH in the cellulose, which is interpreted as being equiv. to a unimol. layer of H_2O over the accessible surface; the first change in direction of the isotherm (at R.H.~10%) corresponds to adsorption of 1 H_2O per primary OH. The flatter portion of the isotherm corresponds to adsorption by sec. OH and cannot occur at >80°. 98% of the surface of moist, swollen cellulose is destroyed by drying, but >25% is lost by solvent-exchange. Adsorption of 6-9% of H_2O increases the colloidal surface of highly swollen cellulose by ~20% but that of unswollen samples 30-fold."—Brit. Chem. Abs. A, I. 1944: 153.

333. ASSAF, A. G., HAAS, R. H., and PURVES, C. B. A study of the amorphous portion of dry, swollen cellulose by an improved thallous ethylate method. Amer. Chem. Soc. J. 66: 59-65. Jan. 1944. 381 Am33J

"Cotton linters, highly swollen in NaOH and dried through MeOH and benzene, were immersed in a large excess of 0.1 N thallous ethylate (I). The thallium cellulosate so formed was methylated with excess MeI in benzene. The MeO content of the product was accepted as proportional to the percentage of the cellulose wetted by the partiuclar liquid in which the I was dissolved. The extent of the methylation did not depend on the mol. vol. of normal hydrocarbon solvents for the I, but the relationship was inverse and linear for the normal ethers from di-Et to di-Am. Branched-chain or cyclic ethers and hydrocarbons penetrated the cellulose less efficiently than their normal analogs and thallations in alcs., although reproducible, were thought to be incomplete. 'Amorphous' cellulose is defined to be the percentage wetted by an ether of 0 mol. vol. and was estd. by extrapolating the linear methylation-mol. vol. plots of 3 or more straight-chain ethers. An extrapolation of the similar plot for the normal alcs. from Et to hexyl tended to confirm the results, which was probably accurate to ±10%. The amorphous fractions of swollen linter samples were as high as 27 ± 2% but the amt. present in unswollen fibers was of the order of 0.25 to 0.5%. The corresponding colloidal surfaces, ranging from 520 X 10^4 to 5 or 10 X 10^4 sq. cm. per g., were not inconsistent with published estimates based upon other exptl. methods."—Chem. Abs. 38: 1105.

334. BRABENDER, G. J. Water vapor permeability of moisture sensitive materials. Paper Trade J. 119(16): 52-55. Oct. 19, 1944. 302.8 P196

"A composite sheet material (such as moistureproof 3-ply glassine) offers particular difficulty in the detn. of its water-vapor permeability by accelerated methods. The cellulosic material in such a sheet has a marked tendency to absorb water, whereas the 2 films of microcryst. wax act as effective barriers to water-vapor transfer. This type of construction demands that special attention be paid to the factors of: (a) sheet distortion on the test cell, (b) the prolonged period before the sheet reaches equil. with the testing conditions and (c) a low rate of change in wt. caused by true water-vapor transfer. Certain advantages in making permeability tests have been found by using a lightweight test cell made as a shaped, seamless, metal ring having 2 open faces. Test

334. BRABENDER, G. J. (Cont.)
assemblies made up with such cells have a low gross wt., a small vol. of confined air, occupy a small space in the cabinet, tend to minimize sheet distortion, and provide a fairly large test area. Ordinary rosin is not recommended as a component in the sealing medium for water-vapor permeability tests because of its tendency to gain wt. under high humidity and temp. conditions. This gain in wt. is probably due to both oxidation and moisture adsorption. Certain microcryst. waxes and specially treated rosins have been found to be free from these defects and have other suitable properties for use in sealing compds. Also in Tech. Assoc. Papers 27, 473-6(1944)."—Chem. Abs. 39: 189.

335. ILLINGWORTH, J. W. The density of textile fibers. Part II. Textile Rec. 62(738): 57-59, 61, 67. Sept. 1944. 304.8 T311

"Tables show the d. of many natural and synthetic fibers, the d. of non-swelling media. Several curves and tables are shown. The strength in lb./sq. in. of a filament is shown to be directly proportional to the product of the strength in g. denier and the d. of the filament. Conversely the strength in g. per denier of a filament of given cross section is inversely proportional to the d."—Chem. Abs. 39: 419.

336. LAUER, K. Ueber den bau natürlicher fasern und ihre quellungseigenschaften. Papier Fabrik. No. 8, p. 268-271. Aug. 1944. 302.8 P197

Cotton changed to low D. P. by hydrolysis showed no marked changes in swelling, heat and dye sorption or relative wet strength. Mercerized cotton showed marked increase in wet and dry strength. By heat and dye sorption, mercerization increased greatly the inner surface of cotton. It is not increased by repeated mercerization. On cooling unmercerized cotton to -150°, wet strength remained the same but degree of swelling increased. Mercerized cotton showed no increase in swelling. Unmercerized cotton showed more elongation than mercerized. Staple fiber was similarly studied. On the basis of these various data, the structure of cellulose fibers was discussed.

337. LAUER, K. Zur kenntnis der zellulosefasern. 5. Mitteilung: Die sorption organischer dämpfe an zellulosefasern. Kolloid Ztschr. 107: 86-88. May 1944. 384 Z315

"The results, which in general confirm those reported by Kanamaru and Chao (C. A. 32, 9483[4]), show that the adsorption isotherms of purified cotton for all org. liquids investigated deviate from the S-shaped isotherm characteristics for H_2O. Nevertheless, the adsorption isotherms for the lower (polar) alcs. (MeOH and EtOH) reflect, as do those for H_2O, the overlapping of adsorption and swelling phenomena, though in a different order. In contrast, propanol, isopropanol and butanol, as well as benzene, toluene, paraffin hydrocarbons, CCl_4 and $CHCl_3$, produce pure adsorption isotherms without involving swelling phenomena. AcOH produces swelling only, whereas acetone shows indifferent behavior at low and adsorption at higher vapor pressures. Similar results are obtained with viscose rayons. Swelling-by-wt. and swelling-by-vol. data are compared and confirm the results shown by the isotherms. Heat of adsorption is pos. in all cases, but the difference which native cellulose and cellulose hydrate fibers show in H_2O disappears in most org. liquids."—Chem. Abs. 39: 183.

338. KING, G. Sorption of vapours by keratin and wool. Faraday Soc. Trans. 41: 325-332. June 1945. 382 F22

"A previous investigation showed that owing to the very large surface-volume ratio of wool fibres, the rate of adsorption of water vapour was governed almost entirely by the heat evolved and the conseqent rise in temperature of the fibres during adsorption. A direct study of the diffusion of water into the fibres was thus impossible, and indirect methods have had to be used to gain some insight into the diffusion process. Two indirect methods are available. Larger molecules, such as alcohols, can be used so that the diffusion process becomes slower and therefore more likely to control the observed adsorption, or the diffusion of water into horn can be studied. Horn has chemical and physical properties very similar to wool, and specimens can be chosen with a small surface-volume ratio so that diffusion into the bulk of the material is the rate controlling process. Both methods have been used in the present work to give some indication of the complex mechanism governing the diffusion of foreign molecules into keratin. The absorption and desorption rates for water, methyl alcohol, and ethyl alcohol by wool and horn keratin have been investigated for those cases in which diffusion is the rate controlling process. The results confirm the conception of a diffusion coefficient which increases with concentration, and show that this leads to the building up of a steep front, which advances through the medium as the absorption proceeds. This does not affect the parabolic form of absorption for semi-infinite media but leads to an approximately linear rate in the case of finite media."—Author's introduction and summary.

339. REES, W. H. Some experiments on the evaporation of water from a plane surface. Textile Inst. J. 36: T165-T168. July 1945. 73.9 T31

"A method is described for measuring the effect of fabrics on the rate of evapn. of water from a moist surface with which they are in contact. In general single layers of scoured and bleached samples had little effect on rate of evapn. from the bare porous plate, some increasing while others decreased it. Water-proofed fabrics, however, greatly decreased the rate of evapn. With 2 layers of a scoured fabric, the rate was greater than for one layer: but with a water-repellent fabric over a scoured fabric, the rate was slightly greater than with the water-repellent fabric alone but was much less than with either the scoured fabric or bare plate alone. When the water-repellent fabric was satd. with water, it also allowed a high rate of evapn. from the surface, but regained its resistance on reconditioning and retesting. Use of an artificial acid perspiration soln. in the app. in place of distd. water did not increase the tendency of water-repellent fabric to wet."—Chem. Abs: 39: 5494.

340. REUMANN, C. H. Fiber regain data simplified. Textile World 95: 101-103. June 1945. 304.8 T315

"Moisture vapor given in terms of relative and absolute humidity. Charts show relative humidity, wet and dry bulb temperatures, fiber regain, adsorption and desorption. Equilibrium figures suggest best conditions for yarn storage."—Authors summary.

341. BERKLEY, E. E., and KERR, T. Structure and plasticity of undried cotton fibers. Indus. and Engin. Chem., Indus. Ed. 38: 304-309. Mar. 1946. 381 J825

"X-ray patterns of undried cotton fibers taken from developing bolls showed little or no evidence of crystalline cellulose. The pattern of native cellulose appeared at the time the fibers underwent their initial dehydration. Undried cotton fibers possessed considerable plasticity. When they were stretched, the slope of the cellulose spiral in the secondary wall was increased and fiber strength was increased. Some crystallization of the cellulose took place as a result of tension even though the fibers had never been dried. Some crystallization of the cellulose occurred when undried fibers were transferred to non-polar solvents. Attempts were made to prevent crystallization of cellulose upon drying by impregnating undried fibers with strong glucose solutions. Fibers impregnated with glucose and dried without tension showed diffraction lines from both substances oriented with respect to the long axis of the fiber. When the impregnated fibers were stretched, certain other lines in the x-ray pattern appeared in addition to the diffraction lines of the glucose and cellulose. Flax fibers, unlike cotton, showed some crystallization before hydration."—Author's summary.

In spite of the fact that undried cellulose is in a swollen condition it behaves differently from previously dried fibers which have been expanded by chemical reagents to the point where they no longer give an x-ray diffraction pattern. Undried fibers react as if the amount of water separating the cellulose chains is definitely limited.

342. FARR, W. K. Calcium pectate in the cotton fiber. (Abs.) Amer. J. Bot. 33: 229. 1946. 450 Am36

"The presence of calcium pectate in the primary wall of the cotton fiber is demonstrated in wall fragments separated mechanically from the secondary lamellae. The role of this substance in determining certain physical properties of the fiber is shown by swelling reactions in water and in cuprammonium hydroxide."—Complete abstract.

343. KERR, T. The outer wall of the cotton fiber and its influence on fiber properties. Textile Res. 16: 249-254. June 1946. 304.8 T293

"Many properties of cotton fibers are influenced by the outer covering, which is known to be different from the inner wall. Rollins has recently emphasized the conception that there are two outer layers in the cotton hair. It is the purpose of this paper to discuss the structure of these outer layers and to show their relation to fiber morphology."—Author's introductory paragraph.

344. ROBERTS, B. R. Dimensional and structural changes in swollen synthetic fibers. Rayon Textile Monthly 27(5): 69-71. May 1946. 304.8 R21

"This paper deals with the influence of swelling and heat plastification on synthetic fibers of the cellulosic and noncellulosic type. Stretching, shrinking, of fibers and the behavior of fabrics made from these fibers are discussed. A few typical examples describe the more important changes occurring in swollen fiber structures."—Author's synopsis.

Contains short review section on swelling of cellulosic fibers.

345. MASSON, O., and RICHARDS, E. S. On the hygroscopic action of cotton. Roy. Soc. London. Proc., Ser. A. 78: 412-429. 1906. 501 L84A

"1. The quantity of hygroscopic moisture required by a given quantity of cotton to put it in true equilibrium with an atmosphere of given humidity, below the saturation value, can be ascertained by taking the mean of the apparent equilibrium values reached by absorption (cotton initially dry) and evaporation (initially over-moist). The progress of either change can be followed by observing the characteristic temperature curve given by a thermometer the bulb of which is covered by the cotton. 2. The vapour tension of any sample of cotton containing a definite quantity of moisture is at different temperatures (at least within ordinary atmospheric range) the same fraction of that of water. The law here is similar to that familiar (Babo's law) in the case of aqueous solutions. 3. Different weights of the same cotton have the same vapour tension when they contain the same percentage weights of hygroscopic moisture. The results are not influenced by tight or loose packing. 4. Filter paper gives results very similar to those obtained with cotton wool; i. e., the same vapour tension corresponds to but slightly different percentage weights of hygroscopic moisture. 5. The vapour-tension curve of moist cotton wool, in which the relative vapour tension (that of water taken as unity) is plotted against percentage weight of hygroscopic moisture, has been determined from p= O to p=0.97 P. Its approach to p=P is probably asymptotic. 6. A new method of hygrometry has been tested, and is described, which is based upon the observations of the rate of rise of temperature of dry cotton when first exposed to moist air."—Summary of results.

346. TROUTON, F. T., and POOL, B. The vapour pressure in equilibrium with substances holding varying amounts of moisture. Roy. Soc. London, Proc., Ser. A. 77: 292-314. 1906. 501 L84A

Vapor pressure curves of cotton and woolen materials containing known amounts of water as well as vapor pressure curves of solutions of electrolytes at various temperatures are given.

347. TRAVERS, M. W. On the absorption of water by cotton and wool. Roy. Soc. London, Proc., Ser. A. 79: 204-205. 1907. 501 L84A

Investigation of relationship of pressure and concentration for the systems water-cotton and water-wool at the temperature of melting ice. The results shown in curves do not exhibit any tendency to bend to the right, as do those representing the results of Trouton's experiments.

Travers says "I have already expressed the opinion that the absorption of vapours by amorphous substances involves the formation of solid solutions, though, since amorphous substances are not physically distinct from liquids, the term 'rigid' solution would be more exact. Crystalline solids would only absorb, in the strict sense, the vapours of substances which, in the solid phase, were isomorphous with them; and if they exhibited absorptive power towards other substances it might be set down to surface condensation or to chemical action."

348. KATZ, J. R. Experimental researches on the analogy between swelling (imbibition) and mixing. K. Akad. van Wetensch. te Amsterdam, Afd. Natuurk., Proc., Sect. Sci. 13: 958-975. 1911. 503 Am8P

"On the view that the processes of swelling and of mixing are essentially the same, the author has made measurements of the dependence of imbition, vapor tension and vol. contraction on the degree of imbibition i (the no. of g. H_2O taken up by I g. of the swelling substance); and also analogous expts. with miscible liquids. The systems investigated were, on the one hand, H_2O with cellulose, casein, woody fibers, gelatin, etc.; on the other hand, H_2O with H_2SO_4, H_3PO_4 and glycerol. In each case the curves obtained with the swelling substances are remarkably similar to those found with the mixtures. These similarities lead the author to the conclusion that amorphous swelling substances differ from liquids only in viscosity. II. Swelling Crystals and Mix-crystals. Ibid., 975-81. The author has det. the variation of vapor pressure with i for the substances carboxyhemoglobin, a globulin from seeds of Cucurbito Pepo, Bence Jones' albumose, and amylodextrin; These are cryst. substances which show the phenomena of swelling. In each case the curves obtained are S-shaped, continuous, similar to each other and the analogous curves obtained with amorphous swelling substances. Analogous detns. were made with 4 substances which are known to form solid solns. with water; namely quercitrin, Ca chabasite, Th oxalate and basic Zr oxalate; the curves obtained resemble closely those obtained with the swelling substances. These expts. show that there is no sharp line of distinction between swelling crystals and mix-crystals, and confirm the hypothesis that swelling is due to the formation of the solid soln. of water in the imbibing substances."—Chem. Abs. 5: 3533.

349. COWARD, H. F., SPENCER, L., and WOOD, F. C. Some observations on sorption by cotton. Textile Inst. J. 14: T529-T533. Dec. 1923. 73.9 T31

"The experiments made enable the following mental picture to be formed of the behavior of bleached cotton in aq. solns. From the simpler crystalloid solns., such as those of neutral salts, dil. acids and alkalies, cotton absorbs into its substance at ordinary temp. about 50 cc. per 100 g. of cotton. The soln. is absorbed as a whole, except for a small but easily measurable preferential absorption which in some cases is probably an adsorption. This raises the question as to the extent and activity of the external surface of the cotton hair, a subject for study by the microscopist as well as the phys. chemist. From stronger solns. of NaOH, much NaOH is absorbed preferentially, and this is accomplished by great swelling. Dil. soln. of cuprammonium hydroxide also shows high preferential absorption. Perhaps preferential swelling is a necessary antecedent to both swelling and soln. of cotton."
—Chem. Abs. 18: 906.

350. PEIRCE, F. T. The plasticity of cotton and other materials. Textile Inst. J. 14: T390-T413. Nov. 1923. 73.9 T31

"Textile materials are not perfectly elastic. If kept twisted or stretched for any length of time, the stresses decrease and a permanent set results. The property of taking up a permanent set is termed plasticity and the opposite property of recovering from or continuing to resist strains, elasticity. The elastic behavior of a material under a strain depends on its resistance to change of vol. and to change of shape. The plasticity of a material under torsion is a general index to its plastic behavior under any type of strain. Plasticity is measured by observing the way in which the torsional resisting couple decreases with time when a thread is kept at a const. twist. A magnetic torsiometer is described and mathematical formulas are deduced for use in calcg. the various constants of torsional behavior. The exptl. results are shown in 6 tables and several charts of logarithmic curves."—Chem. Abs. 18: 591.

351. PEIRCE, F. T. The rigidity of cotton hairs. Textile Inst. J. 14: T1-T17. Jan. 1923. 73.9 T31

"1. The resistance to twist and the forces brought into play by the twisting of cotton hairs have a direct influence on many important properties of yarn. They may be expressed by the couple or twisting force due to one turn per centimetre, a quantity which has been termed the 'rigidity of the hair.' The elastic property of the material on which it depends is the 'Rigidity' which is a measure of the forces due to shear or change of shape without change of volume. These elastic couples were found by suspending a small rod of known dimensions from the hair and measuring the free length of the latter and the time of swing of the rod when twisted and allowed to vibrate freely...The variations among hairs of the same variety are large and the method of sampling is consequently important. Random picking from lightly combed seeds gives the most satisfactory and representative result. The distribution of values is given by a frequency curve of a broad 'cocked-hat' shape with a low-value group due to dead and damaged hairs. Rigidity is a more satisfactory test for such hairs than breaking load as it depends on the whole length of hair, not merely on the weakest section. 2. Correspondence is found between the rigidity and the ribbon-width, length and mass of the hairs. The distribution of length in a sample is found and expressed in a frequency curve by a simple method using Baer's sorter. The most frequent length is taken as the staple length, this being more significant than the mean or the maximum. The hair-weights were found on a quartz-fibre torsion microbalance. The values of these quantities showed that the effective shape of cross-section may be considered as rectangle with semi-circular ends in which the ratio of wall-thickness (half the least diameter) to ribbon-width (greatest diameter) varies

351. PEIRCE, F. T. (Cont.)

from 0.2 to 0.3 and gave a coefficient of rigidity for the cotton material of about 0.23 x 10^{11} dynes. per sq. cm., which is one-tenth that of glass. 3. The values of hair-weight agree with those of length and rigidity in showing that hairs of all kinds have an approximately constant volume of cellulose which is independent of staple length but varies with conditions of growth. The variations which occur give information regarding those conditions of environment and heredity which affect the length and secondary thickening respectively. For normally developed hairs, the volume is about 3.8 x 10^{-6} ccs., i.e., there are about 4 1/4 million hairs to the cubic inch of cellulose and 78 1/2 millions to the pound."—Author's summary.

352. KATZ, J. R. Die bedeutung der röntgenspektrographie für quellungsprobleme. Phys. Ztschr. 25: 659-666. 1924. 334.8 P562

"A summary and discussion. The X-ray diffraction diagrams from substances which swell in fluids taken before and after swelling should give important data on the mechanism of the process. If the identity period of the cryst. substance is smaller than the distance between the centers of mols. (due to regular reappearance of at. groupings in the mols. themselves) it may not be possible to tell whether the substance swells because of the entrance of the liquid between mols. or between groups of mols. Numerous references to the literature are included."—Chem. Abs. 19: 1212.

353. KATZ, J. R. Röntgenspektroskopische untersuchungen über das wesen der quellung bei substanzen, die ein faserdiagramm geben. Phys. Ztschr. 25: 321-326. 1924. 334.8 P562

"The swelling of cellulose, hydrated cellulose and silk fibers in water has been investigated. In the swelling and in the contraction, the X-ray spectra are equally sharp. The assumption, however, that the swelling is always intermicellar must not be made, since the nature of the swelling must be investigated for each case separately." —Chem. Abs. 18: 3129.

354. SHORTER, S. A. The thermodynamics of water absorption by textile materials. Textile Inst. J. 15: T328-T336. June 1924. 73.9 T31

"Starting with Kirchoff's equation connecting the heat of diln. with vapor pressure data, this equation was adapted to a textile material, and from the modified equation the heat of absorption under different conditions of temp. and humidity was calcd. It was detd. for cotton that for the same humidity the first powers of the regain at different temps. are to each other inversely as the first powers of the corresponding temps. For wool (worsted yarn), for the same humidity the squares of the regains at different temps. are to each other inversely as the cubes of the corresponding abs. temps. The thermodynamical reasoning contained in this paper involves the assumption that a true reversible equil. is involved. It is known that there are considerable hysteresis effects when textile materials are taken through cycles including extremes of treatment, but whether there is any appreciable hysteresis in cycles of small range seems to be an open question. Only this latter type of hysteresis would affect the validity of the theory presented."—Chem. Abs. 18: 2813.

355. URQUHART, A. R., and WILLIAMS, A. M. The moisture relations of cotton. II. The absorption and desorption of water by soda-boiled cotton at 25° C. Textile Inst. J. 15: T433-T442. Sept. 1924. 73.9 T31

"Attempts have been made to establish complete absorption and desorption curves for a standard cotton, and to offer a possible explanation of the phenomenon of hysteresis. A more trustworthy method than that previously used (Urquhart and Williams, C. A. 18, 1754), and one applicable at all humidities, has been devised for detg. the moisture content of soda-boiled cotton at 25°. The curves plotted from the results obtained again show that the absorption curve lies higher than the desorption curve, but, contrary to previous statements, these curves do not meet at zero humidity, but at a point corresponding with 1.18% relative humidity. Nor do the curves meet at 100% relative humidity. An explanation of this phenomenon is offered which depends on a theory of the capillary structure of cotton not inconsistent with botanical views. At 100% relative humidity the moisture content of soda-boiled cotton is 22.6%."—Chem. Abs. 19: 1631.

356. URQUHART, A. R., and WILLIAMS, A. M. The effect of temperature on the absorption of water by soda-boiled cotton. Textile Inst. J. 15: T559-T572. Dec. 1924. 73.9 T31

"The expts. deal with the absorption of water by cotton at all humidities and at temps. up 110°, the data being of practical application in testing cotton materials and also the control of conditions prevailing in the steamer used in calico printing. The results show that when the relative humidity is const. at less than 80%, increase of temp. from 10° to 110° decreases the moisture content of the cotton. When, however, the relative humidity is const. at more than 80%, a similar decrease in moisture content only occurs as the temp. is raised from 10° to 50°, while from 60° to 110° the moisture content may actually increase with rise of temp. It appears therefore that the increase of moisture content, under constant high humidities, which begins at about 60°, is due to swelling of the material and the consequent exposure of new surface. Any process which depends for its success on the swollen state of the cotton will consequently become easier above 60° at high humidities. The most suitable conditions for such a process as steaming in calico printing, which depends largely on the moisture content of the cotton, can be placed at 100° and a relative humidity of 100%."—Chem. Abs. 19: 898.

357. URQUHART, A. R., and WILLIAMS, A. M. The moisture relations of cotton. The taking up of water by raw and soda-boiled cotton at 20° C. Textile Inst. J. 15: T138-T148. Mar. 1924. 73.9 T31

"A summary of previous work is given. The present paper describes a prolonged investigation of the subject in which a single detn. of moisture content usually required 3 weeks, and all changes of wt. greater than 0.3 mg. were regarded as significant. The results show that there are at least 2 possible values for the moisture regain for a sample of cotton exposed to an atm. of given temp. and humidity, a higher value if the cotton had been initially wetter than the atm., and a lower value if it had been drier. In addn. it is shown that previous heat treatment affects the moisture regain. If cotton is heated to 110° it is less able to absorb water vapor. Soda-boiled cotton takes up considerably less water than raw cotton when placed dry in a moist atm."—Chem. Abs. 18: 1754.

358. URQUHART, A. R., and WILLIAMS, A. M. The moisture relations of cotton. The absorption of water by cotton mercerised without tension. Textile Inst. J. 16: T155-T166. June 1925. 73.9 T31

"The variations in water-fixing power of mercerized cotton with the conc. of the mercerizing soln. employed are strikingly similar to the variations in dimensions of the unit hairs. Thus when mercerized with 15%NaOH or 28%KOH, which solns. are known to produce the max. swelling, the cotton also has a max. hygroscopicity. On the other hand, the ratio between the moisture content the mercerized and unmercerized scoured cottons at the same atmospheric humidity is independent of the degree of that humidity. When mercerized with 15%NaOH the regain is about 1.57 times as great when the material is absorbing moisture, and 1.46 times as great when losing moisture, as the regains of unmercerized cotton no matter what the prevailing humidity may be. Mercerization increases the accessible surface of the cotton in proportion to the mercerization ratio, which therefore, might be used as a measure of the absorptive capacity of the material for dyes as well as water."—Chem. Abs. 19: 2749.

359. HEDGES, J. J. The absorption of water by colloidal fibers. Faraday Soc. Trans. 22: 178-193. 1926. 382 F22

"Expts. to det. if heat of water adsorption of textile fibers is given by a form of Kirchoff's equation and to obtain curves showing relation between c, the moisture content and H the relative humidity are made. From a general expression for the change of internal energy of a fluid, the deduction of a relation between Q_c (the heat of adsorption) and H is indicated. As direct measurements of Q_c are difficult, a relation between it and W_c (the heat when there is complete wetting of the dried material) is used. . . Heats of absorption from Kirchoff's equation and W_c are in fair agreement. Theories of the mechanism of absorption are given."—Chem. Abs. 21: 1389.

360. HERZOG, R. O. Ueber die quellung der zellulose. Kolloid Ztschr. 39: 98-107. 1926. 384 Z315

"Electrolyte-free polysaccharides do not swell in water. The swelling is greatest when the concn. of the electrolyte is equiv. to the combining capacity of the cellulose. The compds. of cellulose with alkali hydroxides and with Schweitzer's reagent are highly dissocd. The compds. of cellulose with HNO_3 and with alkali salts and with alk. earth salts are but little dissocd. In the first case one deals with hydrated ions; in the second case with hydrated mols. The effect of ionogens on hydration has the same trend when compared with hydrophilic properties that solubilities have when the same comparison is made. The mass of water imbibed cannot be related to the heat of mercerization. The swelling breaks apart the cellulose crystals and at least partially destroys the material which held them together in their natural state. Mercerization is accompanied by contraction, and softening of the cellulose, and by a disappearance of the X-ray diagram. The tension due to contraction seems to be independent of the mercerizing agent. Swelling changes both the tensile strength and the elasticity of the cellulose fibers. Natural cotton fibers are stronger than artificial fibers. Mercerization under tension gives the strongest ramie fibers. A definite density of about 1.36 for $Ca(CNS)_2$ as a swelling soln. gave an extensibility as high as 39.7%, which is greater than for either a larger or a smaller concn. Swelling and losing water cause changes in the ability to absorb water in the outer layers of the cellulose particles as well as in the mechanical properties of the fibers."—Chem. Abs. 20: 3078.

361. KATZ, J. R. Die wärmeentwicklung bei der verquellung und mercerisation der cellulose, verglichen mit den ergebnissen der absorptions-versuche und der röntgenspektrographischen messungen. Ztschr. f. Elektrochem. 32: 269-274. 1926. 384 Z342

"Work of Barratt and Lewis (C. A. 16, 3545), is discussed in detail. The rapidly rising part in their heat of swelling-concn. NaOH curves between two bends at 15 and 30% NaOH corresponds to the horizontal part in the NaOH absorption curve, previously found by Vieweg, recently confirmed by Heuser, König, etc. By the assumption of the presence of definite alkali cellulose compds. this coincidence can probably be explained; several ways are possible. The alkali cellulose compd. is noticeable in the X-ray diagram by the appearance of a new pattern at NaOH concns. between 10 and 15% of which the intensity increases with the NaOH concn. (at high concns. both original and new pattern widen up for 5%). The heat formation of this compd. may be considerable. In this fact the reason can be sought for the more intense action of NaOH at low temps. on cellulose. The same alkali acts considerably less at 18° than 2° and least at 37° as detd. by the relative intensities of the cellulose and the NaOH-cellulose X-ray spectrum."—Chem. Abs. 20: 3087.

362. KING, A. T. The specific gravity of wool and its relation to swelling and sorption in water and other liquids. Textile Inst. J. 17: T53-T67. Jan. 1926. 73.9 T31

"Indicates in a general way, without going into scientific details, the significance of specific gravity determinations in relation to other properties, such as regain and swelling, and its application as a means of investigating the effect on wool fibre of such reagents as it may meet with in the course of manufacture."—Author's summary.

363. TERZAGHI, C. The mechanics of adsorption and of the swelling of gels. In Colloid Symposium monograph, v. 4, p. 58-78. New York, Chemical Catalog Co., 1926. 386 N21

"An attempt to explain the relationship between the elastic expansion of coarse-grained soils and the swelling of elastic gels. The formulae of Katz and of Freundlich and Posnjak for the swelling pressure give discordant values. Harkins' pressure hypothesis is not in accord with the facts. If the adsorbed layer is considered as a zone of forced vibrations, the effect of the solid phase is similar to undercooling, and it extends much beyond molecular range. This mechanical tension can account for increased density and viscosity in the liquid, and for vapour-pressure changes. Lowering of vapour pressure is regarded as due to (a) tension in the liquid, representing the capillary part of the swelling process, and (b) a change in the molecular energy of the liquid, representing the molecular mechanical part of the adsorption process. With increasing concentration of the gel (a) is dominant."—Brit. Chem. Abs. A, 1927: 622.

364. URQUHART, A. R., and WILLIAMS, A. M. The moisture relations of cotton. The absorption of water by cottons of various origins. Textile Inst. J. 17: T38-T45. Jan. 1926. 73.9 T31

"The differences which are observed among raw cottons with reference to water absorption are considerably reduced by the partial purification effected by boiling with water. It is probable that the pure celluloses of these various cottons are only slightly variable, the observed differences being largely attributable to the non-cellulosic impurities. The removal of the non-cellulosic materials is accompanied by a reduction in hygroscopicity. Dyed materials exhibit a further reduction which cannot be wholly explained in terms of loading the cotton with non-hygroscopic substances."—Chem. Abs. 20: 1326.

365. CASSEL, H. Zur theorie der adsorptionswärme. Erwiderung an Herrn B. Iliin. Phys. Ztschr. 28: 152-153. 1927. 334.8 P562

"Polemic with Iliin. C. A. 20, 1022: 21, 1577."—Chem. Abs. 21: 1916.

366. DAVIDSON, G. F. The specific volumes of cotton and wool. Textile Inst. J. 18: T275-T276. July 1927. 73.9 T31

"A reply to King, Textile Inst. J. 18: T274-T275. 1927.

367. HEDGES, J. J. Moisture relations of colloidal fibres. Textile Inst. J. 18 (Special issue): T350-T359. Sept. 1927. 73.9 T31

"... Curves for the variation of moisture content of chemically-pure wool with atmospheric R. H. are of the usual sigmoid character given by other hygroscopic colloids. The heat of wetting dry wool is considerable, being 24.1 g.-cal./g. Wool and its absorbed water may be considered as a two-phase system in which a little water is adsorbed by the colloid particles, whilst the bulk is held in a system of pores. The difference between the apparent (in water) and true specific volumes of wool is much greater than that between the corresponding values for cotton, which, in conjunction with the relative values of the saturation moisture contents, points to a much greater contraction in total volume for wool. ..."—Brit. Chem. Abs. B, 1928: 46.

368. KING, A. T. The specific volumes of cotton and wool. Textile Inst. J. 18: T274-T275. July 1927. 73.9 T31

Comments on Davidson's paper Textile Inst. J. 18: T175. 1927.

369. MANN, J. C. The influence of humidity on the elastic properties of cotton. On the breaking load at 20° C. Textile Inst. J. 18: T253-T264. July 1927. 73.9 T31

"The results of nine series are analysed in detail individually and statistically, and it is shown that the strength of single hairs does increase with increasing humidity, the increase being of the order 10-15 per cent. of the breaking load at 44 per cent. R. H., in fairly good agreement with the results of Obermiller and Goertz (Melliand's Textilberichte, 1926, 7, 163) for the magnitude of the effect, but a much smaller estimate than that given by Willkomm (Heermann. 'Mechanisch-und Physikalisch-technische Textiluntersuchungen,' p. 173, Berlin, 1912). The relationship between strength and humidity is not linear, the curve flattening out above 66 per cent. R. H. but showing no conclusive evidence of a maximum in the neighbourhood of 80 per cent. as claimed by Willkomm (see above). It is further shown that at low humidities up to 66 per cent. R. H., humidity plays an important part in determining the strength of a sample of single hairs, but that above 66 per cent. R. H. the effect is negligible."—Author's summary.

370. NEUENSTEIN, W. VON. Ueber löslichkeit, quellung und adsorption von zellulose in alkali. Kolloid Ztschr. 43: 241-249. 1927. 384 Z315

"The amt. of cellulose dissolved in alkali depends on the amt. of cellulose taken (cf. v. Buzagh, preceding abstr.), and it is probable that both adsorption and peptization processes take place. The degree of swelling of cellulose in water and alkali is similarly affected, and it is suggested that the content of electrolytes or of decompn. products in the cellulose may have an influence on the swelling."—Chem. Abs. 22: 4310.

371. SWAN, E., and URQUHART, A. R. Adsorption equations. A review of the literature. J. Phys. Chem. 31: 251-276. 1927. 381 J822

"All the various equations that have been proposed to represent adsorption phenomena are collected and their applicability to actual adsorption systems is discussed. The headings are: General Adsorption Equation, Isotherm, Isobar, Isotere, Rate of Adsorption, Heat of Adsorption and Conclusion. A bibliography of 117 references is included."—Chem. Abs. 21: 1388.

372. CLAYTON, F. H., and PEIRCE, F. T. The influence of humidity on the elastic properties of cotton. IV. The rigidity of soda-boiled cotton, and effects thereon of history and temperature. Textile Inst. J. 20: T315-T332. Nov. 1929. 73.9 T31

"Torsional rigidity, which allows of the simplest and most accurate measurement, is used as a general index to the relation of elastic properties to moisture. This quantity is the couple or torque required to twist the hair one turn per centimetre, and is calculated from the time of vibration of a small horizontal rod suspended by the hair. It depends on three factors, (1) a specific rigidity or modulus of the material, (2) the square of the cross-sectional area, (3) the effective shape of the section for resistance to torsion. The cotton hair may be regarded roughly as a bundle of spiral elements, in themselves elastic and unaffected by moisture, held together laterally by forces very sensitive to absorbed water. It is this sideways cohesion which chiefly affects the rigidity and its changes, so that these are the most sensitive index to the effects of water absorption...The effect of temperature in diminishing the rigidity, even of dry cotton, is twice as great as that on the most sensitive metal, aluminium. The magnitude of the effect increases with the moisture content, being five times greater when the cotton is under normal conditions than when it is dry. This may be interpreted on the above-mentioned theory of absorption as indicating a very great sensitivity to temperature of the hydrated cohesive bonds and a formula to give the temperature effect at any moisture regain is deduced...Moisture absorption is found to differ in the same cotton at the same humidity, according as it was previously wet or dry. Rigidity tests show the same difference, and follow the regain rather than the humidity. Measurement of rigidity is a sensitive method of following the changes which occur in single hairs when taken from one condition to another. These are very rapid just after the change-over, but the last small change of rigidity takes place very slowly. Nine-tenths of the whole effect takes place in about three minutes, and, to a first approximation, the time does not seem to depend on the magnitude of the change or on whether it is up or down the scale of humidities. The corresponding period for the change in weight of cotton in bulk, sliver, yarn, or cloth was found to be about 3 hours. The difference is partly due to the time taken for the moisture to diffuse between the hairs in bulk, partly to the greater effect on the rigidity of the outer layers of the hair wall....That water goes between rather than into the spiral elements is indicated by the swelling. There is hardly any increase in length, but the diameter swells by about 1.4% on an increase of 10 R.H., and more towards saturation. Similar, though less marked, effects have already been found in starch. They all support the view that the large molecules tend to link up regularly by their strongest forces, turning weaker sides out to the water, from which they solidify or which they absorb. Cotton is formed in the boll slowly and therefore evenly; mercerisation opens up the close-packing somewhat, whilst in a film obtained by evaporation starch molecules are thrown together rather higgledy-piggledy. A further curious fact is thus explained, that soda-boiled cotton swells more than mercerised, and this more than starch, though the amount of water absorbed is in the reverse order. The more free space, the greater is the absorption but less swelling is needed to accommodate the water. The effect of absorption on rigidity is also opposite to the degree of absorption, in a direct comparison between soda-boiled and 'mercerised' hairs. Starch has previously been found less sensitive than cotton."—Adapted from author's general discussion.

373. PEIRCE, F. T. A two-phase theory of the absorption of water vapor by cotton cellulose. Textile Inst. J. 20: T133-T150. June 1929. 73.9 T31

"It is assumed that there are 2 distinct ways or phases in which H_2O mols. are held in cotton cellulose, the a phase in which 1 H_2O mol. is definitely assocd. with 1 hexose unit as in a chem. compd. and the b phase in which the H_2O mols. fill the spaces available under attractive forces like those in a liquid. It is the a H_2O that influences such properties as strength, elasticity, rigidity, swelling and evolution of heat, while the b H_2O supplies the necessary moisture for chem. reactions, growth of organisms and vapor pressure. By assuming that, during absorption, the fraction of the total H_2O taken up that goes into the a phase is proportional to the ratio of unoccupied a positions to total a positions, it is shown that $C_a=1-e^{-qC}$, where C is the no. of mols. of total H_2O per hexose unit and C_a the no. of mols. of a H_2O per hexose unit. Expt. indicates that q, a const. of the dynamic equil. between the a and b phases, is close to 1. It is thus possible to divide the observed absorption of H_2O by cotton into the a and b phases. The S-shaped relation between rigidity and humidity reduces to a linear relation with the a H_2O and the vapor pressure becomes a simpler relation with the b H_2O."—Chem. Abs. 23: 5381.

374. SHEPPARD, S. E., and NEWSOME, P. T. The sorption of water vapor by cellulose and its derivatives. J. Phys. Chem. 33: 1817-1835. 1929. 381 J822

"Various types of cellulose and its derivs. were studied with respect to sorption of water vapor and all exhibited hysteresis. The increased sorption by the hydrated cellulose is accounted for on the basis of differences of 'fine structure' between the native and mercerized cellulose. Sorption decreased as the amt. of esterification increased and depended upon the method of esterification, i. e., whether or not the cellulose is dissolved in the prepn. of the ester."—Chem. Abs. 24: 956.

375. SOMMER, H. Der einfluss der luftfeuchtigkeit auf den feuchtigkeitsgehalt der faserstoffe. Melliand Textil Ber. 10: 214-216. 1929. 304.8 T312

English translation in MelliandTextile Monthly 1: 242-244. 1929.

"The amount of moisture contained in a fibre depends on the relative atmospheric humidity, the hygroscopic capacity, the length of time exposed to the atmospheric humidity, and the state of the material, e. g. the presence of hygroscopic bodies, the degree to which the fibre has been advanced in manufacture, etc. Formulae and curves are given expressing the moisture content as a function of the relative humidity, together with tables showing the moisture contents of wool, silk, artificial silk, cotton and bast fibres at various humidities."—Textile Inst. J. 21: A91.

376. TROGUS, C. Beziehung zwischen quellung, salzbildung und feinbau bei der cellulosefaser. Papier Fabrik. 27(4): 55-60. 1929. 302.8 P187

"A discussion correlating x-ray, microscopic and chem. studies on normal and mercerized cellulose and artificial fibers. Illustrations and numerous references are included."—Chem. Abs. 23: 3081.

377. URQUHART, A. R. Adsorption hysteresis. Textile Inst. J. 20: T117-T124. June 1929. 73.9 T31

"It has been shown by McGavack and Patrick (C. A. 14, 1776) that the apparent hysteresis in some gaseous adsorptions, e. g., SO_2 on SiO_2 gel at 25°, is due to exptl. error. Air held by the adsorbent is displaced by the absorbed gas and increases the observed pressure in the app. This explanation does not account satisfactorily for all cases of hysteresis recorded in the literature and it is now shown experimentally that there is marked hysteresis in the adsorption of H_2O by SiO_2 gel at 25° even though all air is carefully removed from the system. It is suggested that the observed hysteresis is real when the adsorption isotherm is S-shaped, especially when there is a strictly reversible region at the lowest pressures, and that such phenomena are encountered when the adsorption takes place at temps. well below the b. p. of the vapor adsorbed but not at temps. well above the b. p."—Chem. Abs. 23: 5380

378. URQUHART, A. R. The mechanism of the adsorption of water by cotton. Textile Inst. J. 20: T125-T132. June 1929. 73.9 T31

"It is the purpose of the present paper to discuss the intimate structure of cotton regarded as a colloidal gel. and to present a theory which has been of value in explaining on a common basis many of those apparently unrelated observations."—Author's introduction.

379. BROWN, K. C., MANN, J. C., and PEIRCE, F. T. The influence of humidity on the elastic properties of cotton. V. The tensile behaviour. Textile Inst. J. 21: T186-T204. Apr. 1930. 73.9 T31

"Breaking load, extensibility at break, stress-strain curves, Young's modulus, etc. have been determined for single hairs of various cottons (raw, soda-boiled, and mercerised) and for filaments of viscose rayon, under different conditions of atmospheric humidity and temperature. The effects of temperature and humidity, the behaviour of Young's modulus, the effect of length of specimen, etc. are discussed, and the results are examined statistically. Comparisons are made between the elastic properties of the cotton hairs and those of yarns. It is concluded that differences in specific strength, extensibility, etc. between varieties of cotton can be explained largely as the effect of flaws rather than of intrinsic specific differences in the cellulose."—Brit. Chem. Abs. B, 1931: 477.

380. HALL, A. J. Cellulose--some relations between its moisture regain and reactivity. Amer. Dyestuff Rptr. 19: 509-514. Aug. 18, 1930. 306.8 Am3

"Being a colloid, film or fiber, cellulose has a reactivity to external influences, dependent on its internal reactive surface. This extent can be approx. measured by its moisture regain. Controlled mercerizing treatment of cellulose without tension causes a graded swelling (accompanied by a length shrinkage), which increases the proportionate reactivity for many things such as moisture, direct dyes, I. Tension reduces the swelling and the reactivity. Viscose rayon, swelled by alkali treatment, has increased dye affinity but not increased moisture affinity, suggesting that the limit of this is 11-12%. Cu nos. obtained with alk. hypobromite soln. also measure small changes in reactivity."—Chem. Abs. 24: 5479.

381. HULSHOF, H. Quellungsdruck und osmotischer druck. K. Akad. van Wetensch. te Amsterdam, Afd. Natuurk., Proc., Sect. Sci. 33: 165-175. 1930. 503 Am8P

"The forces at the two limiting surfaces between a liquid and solid in contact, and the thermodynamic potential of a limiting surface, are discussed. The nature of swelling pressure is considered and the conclusion is reached that osmotic pressure is the same as swelling pressure. Osmotically active particles are swelling centers in the solvent medium. For proof of this the conception of the anisotropy of the pressure, as a result of mol. attraction, is necessary. The relationship of swelling pressure to the properties of Perrin's particles is discussed, and also the effect of swelling pressure on diffusion."—Chem. Abs. 24: 5205.

382. LIPATOV, S. M., and SOKOLOVA, N. M. ÎAvleniîa sorbtsii i khimicheskie profsessy. Stat'îa VI. K voprosu o stroenii alkali-tsellîulozy i nabukhaniîa tsellîulozy. Russ. Fig. Khim. Obshch. Chast Khim. Zhur. 62: 1785-1793. 1930. 385 R89

"Cellulose forms a compd., $(C_6H_{10}O_5 \cdot 3NaOH)_n$, when treated with aq. alkali. The imbibition of cellulose films in water is due to entry of water within the pores of the membrane, while in alkali solns. the cellulose mols. are covered by a unimol. layer of water."—Chem. Abs. 25: 4120

383. SAINI, H. Contribution expérimentale à l'étude calorimétrique de l'imbibition. Helvetica Phys. Acta. 3: 1-16. 1930.

Study of the amount of energy liberated in the form of heat in case of the absorption by a porous body (blotting paper) of different liquids (petroleum, oil, water); this energy is great in comparison with that utilized for the ascension of the liquid in this same porous body.—Translation of the author's summary.

384. SHEPPARD, S. E., and NEWSOME, P. T. The sorption of water vapor by cellulose and derivatives. Part II. The kinetics of sorption. J. Phys. Chem. 34: 1158-1165. 1930. 381 J822

"The rate of sorption depends primarily on diffusion, but a structure factor of porosity intervenes. One stage of the sorption process is the attachment of water mols. to free hydroxyls of the cellulose mol. Some of the cellulose hydroxyls are free, since cellulose takes up only 23% as 'hydrate cellulose' and 16-18% as 'native' cellulose, while it could take up 33% if each hydroxyl were free, to the extent of binding only 1 water mol. A varying portion of this adsorbed water is held under varying constraint and corresponds to liquid held in pores. Nuclei for filling these pores are provided by the surface hydroxyls. Since cellulose colloids form elastic gels, ratio of free hydroxyls to bound hydroxyls probably increase with adsorption of water, and decreases again on desorption, with change of pore space. This agrees with the reduced mechanical strength of increased adsorption, and might explain why the kenetics of the process are largely but not completely those of a diffusion process. Exact conditions of the diffusion equation are not maintained, therefore, the material being more coarse grained, and this graininess actually changes with the progress of the sorption itself, so that the total diffusion path is not constant."—Chem. Abs. 24: 3641

385. URQUHART, A. R., and ECKERSALL, N. The moisture relations of cotton. VII. A study of hysteresis. Textile Inst. J. 21: T499-T510. Oct. 1930. 73.9 T31

"It is shown that the absorption and desorption curves for cotton form the boundaries of an equil. area, any point on which is capable of representing the amt. of water present in cotton under appropriate conditions of humidity and prehistory. Consequently in textile testing, fixing the temp. and relative humidity at const. values may not be sufficient to ensure comparable conditions, and addnl. precautions may be necessary if there are large differences of prehistory. The description curve above 80% relative humidity is indefinite in that above this value the amt. of H_2O retained is greater the greater the original excess above the satn. value. A definite curve can, however, be obtained when H_2O is removed from cotton contg. at least 40% H_2O. Cotton taken direct from the boll, or while still wet after kierboiling or mercerizing, has an exceptionally high adsorptive capacity. Suggestions regarding the practical application of this property in technical processes are given. Data are given on the adsorption and desorption of H_2O by Sakel cotton, raw and soda-boiled at 25°; and by raw Webber and Acala cottons, and by soda-boiled and mercerized Sakel cotton at 20°."—Chem. Abs. 25: 1089.

386. PICKARD, R. H. The absorption of water vapor by cotton cellulose. Amer. Chem. Soc. J. 53: 1610-1611. Apr. 1931. 381 Am33J

"Polemical with Pidgeon and Maass (C. A. 24, 1974, 4155). Attention is called to work on the same subject at the Shirley Inst."—Chem. Abs. 25: 2559.

387. FILBY, E., and MAASS, O. The volume relations of the system cellulose and water. Canad. J. Res. 7: 162-177. 1932. 330.9 C16C

"The abs. sp. vol. of cellulose has been detd. by means of He gas. A new exptl. procedure has been developed, which is more accurate than any previously used where a small quantity of porous material is involved. A gas was allowed to expand either into or from the system under investigation and the pressure changes following were used to calculate the d. The method was extended to include the measurement of the vol. of a system resulting from the adsorption of a vapor on a porous material, and applied in this instance to the system cellulose - H_2O vapor. The moisture of the sample was detd. by observing the elongation of a spiral quartz fiber from which the sample was suspended. Helium was not adsorbed on the cellulose surface. The sp. vol. of cellulose in He was found to be 0.640 ± 0.001 cc. The vol. of the system cellulose - H_2O vapor was found to be much smaller than that given by the components cellulose and condensed H_2O, as long as the amt. of adsorbed H_2O was below 4%. With more than 8% of adsorbed H_2O the d. of subsequently sorbed H_2O was found to be the same as that of the normal liquid. The hypothesis is put forward that the first H_2O adsorbed on cellulose enters into a definite chem. combination, considerable contraction taking place, and that subsequently adsorbed H_2O first causes an increase in cellulose surface, with further consequent contraction in the vol. of the two components and then a filling up of the so-called capillary spaces in which the H_2O maintains its liquid properties. The relation of this hypothesis to the hysteresis effect is indicated and the interest of this problem from a practical point of view is discussed."—Chem. Abs. 26: 5414.

388. FOSTER, A. G. The sorption of condensible vapours by porous solids. Part I. The applicability of the capillary theory. Faraday Soc. Trans. 28: 645-657. Aug. 1932. 382 F22

"It is concluded that: (1) the shape of sorption isotherm is detd. largely by the actual size of the pores of the adsorbent; (2) hysteresis is assocd. with capillary condensation; (3) the Kelvin equation is applicable when capillary condensation occurs; (4) no condensation occurs in reversible isotherms."—Dietz, V. R. Bibliography of solid adsorbents, 1944, p. 409.

389. GARNER, W. E. The heats of adsorption and the kinetics of adsorption. Faraday Soc. Trans. 28: 261-269. Apr. 1932. 382 F22

"A discussion of the heats and kinetics of the adsorption of three types of adsorbed layer: van der Waals, reversible chemi-sorption and irreversible chemi-sorption. tion."—Dietz, V. R. Bibliography of solid adsorbents, 1944, p. 359.

390. GRACE, N. H., and MAASS, O. The sorption of vapors on wood and cellulose. J. Phys. Chem. 36: 3046-3063. 1932. 381 J822

"Apparatus and technique for measuring the sorption of vapours by cellulose by the use of a quartz spring balance in an evacuated glass system are described. Results are given for the sorption of H_2O vapour by various woods, and are compared with the vals. for cotton cellulose. Cellulose sorbs gaseous HCl appreciably, but equilibrium is attained very slowly; the process is more rapid with white spruce as sorbent. The form of the sorption curve is quite different from that of H_2O vapour

390. GRACE, N. H. (Cont.)
and resembles the Freundlich isotherm. Equilibrium vals. are reached more quickly with wet wood than with dry wood, and the amount of HCl sorbed by the wet wood is greater (after allowing for the amount taken up by the H_2O present). It is probable that the sorption of HCl approximates to true surface adsorption, in which case the phenomena can be explained by supposing that the H_2O increases the active surface available for adsorption of HCl. Preliminary results are reported on the sorption of SO_2, NH_3, CO_2, Et_2O, amylene, and MeOH. Sorption of Et_2O and of amylene is very small, but large amounts of MeOH are taken up."—Brit. Chem. Abs. A, 1933: 121.

391. HÜCKEL, E. Theory of heat evolved in capillary condensation. Faraday Soc. Trans. 28: 382-386. Apr. 1932. 382 F22

"The theory of capillary condensation should explain heats evolved in condensation provided the radius is not too small, since the heat of condensation in capillary spaces differs from ordinary heat of condensation because: (1) the size of the liquid-vapor interface diminished with condensation, setting free an amt. of surface energy proportional to the surface energy, $\sigma - T(d\sigma/dT)$ and the diminution of the surface; (2) the pressure in the liquid differs from that of a plane surface because of the curvature; (3) during condensation the mean curvature diminishes, causing an increase in the pressure of the liquid already sorbed and releasing energy. There are difficulties encountered in the calculation."—Dietz, V. R. Bibliography of solid adsorbents, 1944, p. 409.

392. JUSTIN-MUELLER, [E.] Aqua-fibre, hydroactivité et diffusion. Tiba 10: 991, 993, 995. Dec. 1932. 306.8 T43

"The differences in hydroactivity of different fibers in the same liquid (e. g., bleached and unbleached cotton) evidently cannot be attributed to differences in surface tension. The resistance of fibers to wetting is attributed to foreign (non-fibrous) substances or to 'hydroinactivity' which retard diffusion into the fibers. The mechanism of the action of wetting agents is considered to be due to their increasing the diffusive power of aq. liquids."—Chem. Abs. 27: 1179.

393. BULL, H. B. Some methodical errors which may arise in the determination of bound water. J. Gen. Physiol. 17: 83-86. 1933. 447.8 J822

"There is an adequate theoretical basis for the 'bound water' hypothesis. A slight adsorption of solute along with the mols. of bound water will explain the failure of certain technics to demonstrate bound water in biochem. systems. The data of Greenberg and Greenberg (C. A. 27, 3730) are discussed and recalcd. by a formula which corrects for the amt. of adsorbed solute."—Chem. Abs. 27: 5770.

394. CLARK, J. D'A. The effects of beating on cellulose fibers. Paper Trade J. 97: 25-31. Dec. 28, 1933. 302.8 P196

"C. gives a review of current theories on beating and 'hydration,' attempting to bring them together into a simple composite theory which satisfactorily explains the different phenomena. Some exptl. data on pulp treatment and results on the adhesion of viscose sheets when pressed together under different moisture conditions indicate that cellulose is probably subject to 'partial soly.' when wetted with H_2O to form a kind of mucilage and offers a field for further investigation. The following theory, somewhat similar to that of Campbell (C. A. 24, 1976; 26, 5416) is advanced: The structure of cellulose fibers is porous, hygroscopic and elastic; the lateral bonds between the rod-like elements formed by the OH groups are not very strong and have a chem. affinity for water; when immersed in H_2O the fibers swell and the component parts are loosened, certain of the OH groups combining with H_2O, this destroying these particular bonds and forming a potentially adhesive layer; beating cuts, bruises and flexes the fiber, opens it up further and softens and fibrillates it; when the sheet is formed the fibrils of all dimensions intertwine and the whole is compacted to a greater or less degree by the effects of surface tension; when the paper is dried the combined H_2O is driven off and mutual OH linkages form to hold the structure together, aided, perhaps, by any other effective noncellulosic materials present. The strength of the sheet primarily depends on the effectiveness with which the fibers and fibrils are prevented from slipping along and between one another, and not on direct tensile effects, which also explains the important function of fiber length on the strength of the sheet. Reply. W. Boyd Campbell. Ibid 98, No. 3, 33-4(1934). Reply. James d'A. Clark. Ibid 34."—Chem. Abs. 28: 2525.

395. HESS, K. Ueber den mechanismus der quellungs- und lösungsvorgänge bei cellulose und stärke und seine bedeutung für konstitutionsfragen. Cellulosechemie 14 (8/9): 122-124. 1933. 309.8 C33

"The complexities of products such as cellulose, starch albumin and rubber, produced by a natural periodic growing process, is discussed from the viewpoint of chem. and phys. characteristics. Acetylation is studied by means of X-ray pictures, microcinematographic analysis of swelling of cellulose fibers, change in mol. wt. during polymerization and depolymerization, osmotic pressure changes, etc. Tech. properties, such as viscosity, spinning quality and film formation are not regarded as dependent on mol. wt. Swelling and soln. are considered as involving formation of derivs. from the swelling material and substratum, involving osmotic cells with semipermeable outer skin membranes, bursting of membranes and probably disturbance of the inner structure. Similar changes are considered as probable for starch, natural silk and gelatin."—Chem. Abs. 27: 5610.

396. OGURI, S. Hygroscopic moisture of cellulose. XI. Consideration on the mechanism of adsorption of water vapour by cellulose. (Abs.) Soc. Chem. Indus. [Japan] J., (Sup. binding) 36: 67B-70B. Feb. 1933. J385 J82

"The absorption of H_2O by cotton cellulose is not an effect of simple dissolution and chemical reaction. From the thermal viewpoint there is scarcely any difference between absorption and condensation of H_2O vapour in the case of standard cotton cellulose. Theories of the mechanism of H_2O absorption are discussed. It is probable that this is due to the attraction of OH groups in the mol. Almost half the OH groups in the cellulose mol. are unsuitably oriented to attract H_2O."—Brit. Chem. Abs. A, 1933: 564.

397. SOBUE, H., and NAGANO, M. Hydration of the fiber. (Abs.) Soc. Chem. Indus. [Japan] J., (Sup. binding) 36: 475B-482B. Aug. 1933. J385 J82

"Sorption of water consists of the adsorption and diffusion (absorption) of water in the fiber. Theoretical equations for both processes are developed and were found to agree well with exptl. results. Desorption of water by fiber consists of the escape (diffusion to air) and the diffusion of water in the fiber. The theoretical equations were developed and agreed with exptl. results which are presented in graphical form. Fibers studied were viscose rayon, cuprammonium rayon, raw silk and wool."—Chem. Abs. 27: 5983.

398. STRACHAN, J. The nature and functions of hygroscopic water in cellulose and paper. Paper Maker and Brit. Paper Trade J. 85: TS81-TS82. Apr. 1, 1933. 302.8 P1922

"The adsorbed or hygroscopic moisture content of paper or cellulose is detd. by the colloidal structure and micelle size of the fibers. Its presence affects such phys. properties as pliability, elasticity and printability, such chem. properties as aging and permanence, and papermaking processes such as calendering and dyeing."—Chem. Abs. 27: 5967.

399. BANCROFT, W. D., and CALKIN, J. B. The action of sodium hydroxide on cellulose. Part 1. Sections 1 and 2. Textile Res. 4: 119-140, 159-182. Jan., Feb. 1934. 304.8 T293

"Since no definite proof of chem. combination between NaOH and cellulose has been established, the process should be considered one of adsorption."—Chem. Abs. 28: 7000.

400. GUYE, C. E. Considérations théoriques sur la propagation de l'imbibition. Helvetica Phys. Acta. 7: 584-604. 1934.

"The capillary rise of a liquid in a strip of blotting paper placed in a vertical position and in contact with a liquid at its lower end follows a logarithmic law analogous to the variation of barometric pressure with height. This result can be deduced theoretically by considering the process either as due to diffusion or as a hydrodynamic problem with allowance for the viscosity effects."—Chem. Abs. 28: 7111.

401. KRATKY, O. Zum deformationsmechanismus der faserstoffe, II. Die ordnung der mizellen von filmen in kleinsten bereichen. Kolloid Ztschr. 68: 347-350. 1934. 384 Z315

"In slightly swollen films, the orientation of micelles is detd. by intermicellar forces, and the micelles are arranged in parallel groups. The constancy of the double refraction quotient on stretching is shown to be theoretically expected for this case, and is confirmed by Wächtler's (cf. C. A. 19, 762) measurements on nitrocellulose films. The parallel arrangement is confirmed by deductions from the differences in d. by macroscopic and X-ray detns., and by mech. analogies."—Chem. Abs. 28: 7106.

402. PEEK, R. L. JR., and MCLEAN, D. A. Capillary penetration of fibrous materials. Indus. and Engin. Chem., Analyt. Ed. 6: 85-90. 1934. 381 J825

"Data from capillary rise of 6 org. liquids confirmed the theory that the rate of rise dh/dt varies linearly with the reciprocal of the height of rise l/h, and that the slope of the straight line obtained by a plot of these quantities is proportional to γ/η in which γ is the penetration tension and η is the viscosity of the liquid."—Chem. Abs. 28: 3288.

403. SCHRAMEK, W. Die struktur der zellulosebaumwollfaser, ihre veränderung durch bekannte veredlungsprozesse und der einfluss der strukturveränderungen auf den verlauf technischer prozesse. Monatschr. f. Textil Indus. 49: 241-244, 257-260, 289-292; 50: 13. 1934-1935. 304.8 L53

"A review is given of the relation between the swelling of the cellulose fiber and its structure, the effect of NaOH on the cellulose fiber, the structural chem. processes on which mercerization is based, and the cause for the frequent color defects in mercerized cotton stockings. Illustrations show the constitution of a cellulose mol. and of a cellobiose member, the fundamental cell of a native cellulose crystallite, and X-ray structures of the fiber after various treatments. Thirteen references."—Chem. Abs. 29: 3844.

404. SHEPPARD, S. E., and NEWSOME, P. T. The sorption of water by cellulose. Indus. and Engin. Chem., Indus. Ed. 26: 285-290. 1934. 381 J825

"Regenerated celluloses adsorb more water than mercerized celluloses. Degrading treatments such as acid tendering and oxidation do not materially change the water adsorption of native cellulose. The mol. wts. of native and regenerated celluloses, as indicated by the viscosity measurements, show no correlation with water adsorption. Wood pulp (α-pulp) has a higher sorption than cotton cellulose, approaching that of mercerized cellulose. The sorption of water by the wood pulp is unaffected by beating. Certain cellulose materials adsorb more water from the liquid phase than from the satd. vapor at the same temp."—Chem. Abs. 28: 2177.

405. STEINBERGER, R. L. The thermodynamics of swelling. Textile Res. 4: 451-462, 513-524. Aug., Sept. 1934. 304.8 T293

"An attempt was made to bring together from the literature the important results of studies on swelling processes that have been made from the thermodynamic point of view. The quantities involved are swelling pressure, free energy, heat of swelling, entropy and vol. contraction. Each is related either to the vapor pressure of the gel by equations derived by simple thermodynamic methods, or is related to the H_2O concn. of the gel by empirical formulas. A comparison of swelling pressure with osmotic pressure is made and it is demonstrated that both arise in the same fundamental process. Entropy changes with swelling are related to the distribution of the H_2O mols. within the gel. Vol. contraction is ascribed to the dissocn. of ordinary H_2O, which has a complex mol., to the simple unimol. form in the gel. Since swelling and capillarity are intimately related phenomena the important points of contact of the two are discussed. Twenty-two references are given."—Chem. Abs. 28: 7111.

406. CAMPBELL, W. B., and RUSSELL, J. K. What is the true density of cellulose? Canada. Forest Serv. Forest Prod. Lab. Pulp and Paper Lab. Quart. Rev., No. 21, p. 24-26. 1935. 99.82 C16

"The d. of cotton cellulose does not vary according to the nature of the liquid medium if precautions are taken to avoid intermediate drying. Values recorded in H_2O, MeOH, EtOH and C_6H_6 all approximate to 0.62, and it is no longer necessary to postulate the presence of H_2O of extraordinarily high d. in order to account for the lower values hitherto obtained with H_2O by comparison with org. solvents. It is believed that the results lend support to the conception of shrinking by forces of internal liquid tension, bonding by recrystallization, and the formation of pockets in the structure when cellulose is freed from H_2O."—Chem. Abs. 30: 5407.

407. LÜDTKE, M. Bau der pflanzenzellwand und dadurch bedingte erscheinungen. Zellstoff u. Papier 15: 273-276, 320-323. 1935.

"A general review of German work on the microscopic structure of cell walls and the relation of structure to permeability, swelling, bleaching, strength, and paper making qualities."—Textile Inst. J. 26: A548.

408. SISSON, W. A. X-ray studies of crystallite orientation in cellulose fibers. Natural fibers. Indus. and Engin. Chem., Indus. Ed. 27: 51-56. 1935. 381 J825

"Crystallites have an unlimited rotation around their 'b' axes in the face of the cell wall. These results are explainable by the assumption of a definite discontinuity of crystalline structure."—Chem. Abs. 29: 1979.

409. STAMM, A. J. Shrinking and swelling of wood. Indus. and Engin. Chem., Indus. Ed. 27: 401-406. 1935. 381 J825

"Factors affecting the dimension changes of wood resulting from moisture content changes are discussed. A simple relationship is shown to exist between the shrinkage and the density of small specimens of wood dried under practically stress-free conditions, which indicates that the volumetric shrinkage is practically equal to the volume of water lost below the fiber-saturation point and that the change of fiber cavity dimensions is small. Deviations from this relationship caused by drying stresses are explained. Data for the swelling of wood in aqueous electrolyte solutions and in dry organic liquids are presented and considered from the standpoint of swelling theories. Data on the replacement of water in swollen wood by other liquids are presented."—Author's summary.

410. STAMM, A. J., and LOUGHBOROUGH, W. K. Thermodynamics of the swelling of wood. J. Phys. Chem. 39: 121-132. 1935. 381 J822

"Detns. were made (for the system Sitka spruce wood-water) of the relative vapor pressure-moisture content desorption isotherms. Temps. varied from room temp. to 100°, and conditions were carefully controlled to minimize the hysteresis effect. Fiber-satn. points decrease linearly with increasing temps., and are reduced by 0.1% per 1° rise. Smooth curves were formed (with zero values at the fiber satn. point) for the differential heats of swelling, and free energy and entropy which were calcd. over the entire sorption range. The relationship between mechanism of sorption and the nature of these curves is discussed. Comparative data on the heats of swelling and free energy and entropy changes for the swelling and soln. in H_2O of various (biol.) org. substances and for H_2SO_4 are included."—Chem. Abs. 29: 2686.

411. GREENFIELD, E. W. Residual moisture in cellulose dielectrics. Franklin Inst. J. 222: 345-358. Sept. 1936. 470 J82

"The colloidal nature and structure of cellulose, the phys. and chem. character of its typical adsorption and its behavior toward elec. stress are considered."—Chem. Abs. 31: 177.

412. GUT, E., and ROGOVIN, Z. O rastvorimosti i nabukhanii tsellīulozy i ee derivatov. Soobshchenie I. Kolloidnyĭ Zhurnal 2: 863-873. 1936. 385 K83

"Theoretical."—Chem. Abs. 31: 7641.

413. HESS, K., and GUNDERMANN, J. Zur frage der struktur der wasserhülle bei micellen organischer kolloide. Ztschr. f. Phys. Chem. Abt. B: Chem. der Elementärprozesse 34: 154-157. 1936. 384 Z37B

"The authors refute the suggestion that the X-ray diffraction diagrams obtained with celluloses, starches, etc., are attributable largely, if not solely, to multimolecular directed layers of water bound to the micelle surfaces. Certain of the lines found with natural cellulose and with cellulose hydrate correspond closely with those to be expected from ice, but the latter would also give lines which are totally absent in the former cases. Moreover, natural cellulose (ramie fiber) gives essentially the same diffraction pattern whether dried in hydrogen at 155-160 C. or, at the other extreme, immersed in water."—Sci. Abs. Sect. A, Phys. 1936: 5351.

414. HERMANS, P. H. Beiträge zur kenntnis des deformations mechanismus und der feinstruktur der hydratzellulose. I. Uber die beziehung zwischen quellungsanisotropie und deformationsmechanismus bei hydratzellulosegelen. Kolloid Ztschr. 81: 143-150. Nov. 1937. 384 Z315

"Attention is called to the value of viscose filaments and films for the study of swelling phenomena. The theoretical relationships between the anisotropy of swelling and the extensibility of isotropic cellulose filaments are derived (a) according to the deformation theory of Eckling and Kratky for highly swollen bodies, in which the micelles are capable of independent movement and (b) on a basis of a conception of the deformation of cellulose gel as the distortion of a cubic network."—Text. Inst. J. 29: A166.

415. NEALE, S. M. Some aspects of fibre structure; the significance of "long-chain" molecules. Silk J. and Rayon World 13(155): 53-54. 1937. 304.8 Si3

"The relation of the main characteristics of fibers to their mol. structure is discussed; such operations as water absorption, dyeing, swelling agents, spinning stretch and the possibility of increasing the strength and durability of rayons are taken into account. The strength of rayons decreases considerably on being wetted because the mutual lateral cohesion between overlapping mol. chains in being sepd. is lessened. The orientation of the mol. chains in rayon is almost entirely dependent on the spinning stretch. Viscosity and chain length seem to be interdependent. Present mfg. processes preclude the maintenance of the long chain mol. structure of the natural cellulose intact, with the resulting improvement of strength. Silk and wool fibers are of the amino acid protein type in zigzagged chain form, while the starch and cellulose fibers are of the glucose chain form."—Chem. Abs. 31: 5583.

416. TANKARD, J. The absorption of water by cellulose and cellulose compounds. Textile Inst. J. 28: T263-T292. Sept. 1937. 73.9 T31

"The work of different investigators to obtain precise information on the absorption of water by cellulose and cellulose compds. and the various theories advanced to explain the assocd. phenomena are reviewed. The method of Champetier (C. A. 27, 5183) for the detn. of water of hydration, viz., the study of the ternary system cellulose-water-Na thiosulfate (or pyridine), is discussed in detail. This method was used in the present study. The results do not indicate that cellulose and its compds. form a limited no. of definite hydrates, but that there is, for each of the substances examd., a max. amt. of water that can be regarded as entering into chem. combination. This max. value corresponds to 0.5 mol. H_2O per mol. $C_6H_{10}O_5$ for bleached cotton and linen cellulose; 0.75 mol. H_2O per mol. $C_6H_{10}O_5$ for mercerized cotton cellulose that was dried subsequent to mercerization; 1.0 mol. H_2O per mol. $C_6H_{10}O_5$ for mercerized cotton cellulose not dried after mercerization, for mercerized linen cellulose whether or not dried after mercerization, and for regenerated (viscose) cellulose; and 3.0 mols. H_2O per hexose unit for cellulose triacetate and for cellulose monomethylene ether."—Chem. Abs. 32: 2733.

417. WALKER, A. C. Moisture adsorption in cotton and other fibrous insulating materials: a proposed explanation. Textile Res. 7: 229-239, 289-297. 1937. 304.8 T293

"While it is not the purpose of this paper to present conclusive evidence for a cotton hair structure of the specific type described, the calculated data are in such close agreement with many experimental facts that it seems reasonable to set forth a few tentative conclusions for the discussion, as follows: 1. The moisture content necessary to form a monomolecular layer on all internal surface of the cotton hair appears to be slightly more than 1% of the hair weight. 2. There appear to be at least two specific kinds of internal surface in fibrous cellulose upon which moisture may be adsorbed. 3. Less than half the internal surface, that termed fibril surface, is considered to be involved in moisture adsorption which causes appreciable transverse swelling of the cotton hair. Upon this surface multimolecular layers of water are assumed to condense, the thickness of such layers increasing progressively up to saturation with corresponding increases in hair diameter during the whole of this range, and each hydroxyl group in the cellulose surface being the base of a water chain, with separations between these chains corresponding to the arrangement of the hydroxyl groups on the cellulose surface. 4. Moisture adsorbed on the remaining internal surface does not appear to be involved in transverse swelling, but may be responsible for the slight longitudinal swelling exhibited by cotton. To account for the amount of water required to form a monomolecular layer on this additional internal surface it is assumed that this surface is within the body of the fibrils, and is located on ends of crystallites. To account for the slight swelling, it is assumed that only a monomolecular layer can be adsorbed on these surfaces. 5. A theory is proposed to explain the dependence of the electrical properties of textiles upon their moisture adsorbing properties, and upon the surface distribution of moisture within the submicroscopic structure."—Author's Tentative conclusions.

418. WALKER, A. C. Moisture in textiles. Bell System Tech. J. 16: 228-246. 1937. 335.8 B41

"Evidence is presented that for a cotton hair structure of the specific type described, calculations are in such close agreement with many experimental data as to suggest the following tentative conclusions: 1. The moisture content necessary to form a monomolecular layer on all internal surface of the cotton hair appears to be slightly more than 1 percent of the hair weight. 2. Less than half the internal surface, that termed fibril surface, appears to be involved in moisture adsorption which causes appreciable transverse swelling of the cotton hair. Upon this surface multimolecular chains of water seem to condense, the length of such chains increasing progressively up to saturation with corresponding increases in hair diameter throughout the whole of this range, each hydroxyl group in the cellulose surface being the base of a water chain, with separations between these chains along the surface corresponding to the arrangement of the hydroxyl groups on the cellulose surface. 3. Moisture adsorbed on surfaces within the cellulose aggregates composing the fibrils does not appear to be involved in transverse swelling, but may be responsible for the slight longitudinal swelling exhibited by cotton. The capacity of the cotton hair for this type of adsorption suggests that its locus is the ends of crystallites and therefore within the body of the fibrils. To account for the slight swelling, it is assumed that only a monomolecular layer can be adsorbed on these surfaces. 4. A theory is proposed to explain the dependence of the electrical properties of textiles upon their moisture adsorbing properties, and upon the surface distribution of moisture within the submicroscopic structure."—Author's abstract.

419. WALKER, A. C. Moisture in textiles. J. Appl. Phys. 8: 261-268. 1937. 334.8 P563

"A theory of the moisture adsorption on cotton (I) is outlined. It is assumed that moisture first adsorbs on dry I on the outer hair surface, then penetrates by diffusion into cracks and pits that spiral around the hair. Less than 0.5% moisture is estd. as being necessary to form a unimol. layer on pit walls and growth ring surfaces, termed fibril surface. About 1% H_2O is required to cover all internal surface with a unimol. layer; hence only about half this total may be significant as providing moisture paths along which current is carried. It appears likely that each adsorbed H_2O mol. in the unimol. layer is held upon active points on the surface, these being the OH groups on the cellulose. Below 1% moisture the very rapid increase in resistivity of I with decreasing moisture content is due to discontinuities in the layer of H_2O adsorbed on the fibril surfaces. A unimol. layer of H_2O does not necessarily provide a continuous film since owing to the structure of cellulose there may be wider spaces between H_2O mols. on certain hydroxyls than on others. This theory is based on the relationship of insulation resistance to moisture content of I and provides a reasonable explanation for a variety of practical problems."—Chem. Abs. 31: 4501.

420. COHAN, L. H. Sorption hysteresis and the vapor pressure of concave surfaces. Amer. Chem. Soc. J. 60: 433-435. Feb. 1938. 381 Am33J

"A mathematical analysis of the phenomenon of hysteresis in sorption systems is made and applied to various published exptl. results."—Chem. Abs. 32: 4037.

421.*GONCHAROV, S. V., and BURVASSER, F. G. [Microstructure of cotton fibers.] Akademiia Nauk, U.R.S.R., Kiev. Institut Khemichnoi Tekhnologii. Zbirnik. No. 4, p. 77-100 (in English, 100) 1938.

"Along with pure cellulose there are very thin films surrounding every structural element of the fiber. Their percentage of the fiber is very small but they greatly affect its properties."—Chem. Abs. 32: 9508.

422. HERMANS, P. H. Beiträge zur kenntnis des deformationsmechanismus und der feinstruktur der hydratzellulose. IV. Über die art des mizellaren aufbaues der hydratzellulosefasern und die vorgänge bei ihrer deformation. Kolloid Ztschr. 83: 71-83. 1938. 384 Z315

"A new theory of the fine structure and deformation mechanism of hydrate cellulose (cellulose xanthate) was developed. If it is assumed that the hydrate cellulose gel consists of rod-like micelles (elemental particles with at least a partial lattice-like arrangement), then the fact that isotropic and oriented cellulose threads show the same specific vol. in the dry state leads to the idea that there is orientation even in the smallest ranges, since

422. HERMANS, P. H. (Cont.)
the d. of both of these structures corresponds with the d. of a substance built up of uniform cylinders of cryst. hydrate cellulose packed as densely as possible. The orientation in isotropic gels changes by progressing in space, slowly and continuously, from micelle to micelle. In the microscopic ranges, however, the orientation changes are instantaneous. The lattice-like oriented polycellobiose chains do not protrude like fringes from the boundary surfaces of the cryst. micelle regions. They are bound, together and with the neighboring micelles, in an irregular manner, by the van der Waal cohesion forces, and they form the union between the micelles in the swollen gels. The swelling of cellulose is, therefore, considered to be due mainly to the swelling of the intermicellar amorphous regions. The size of the max. diams. of the particles imbedded in the swollen hydrate cellulose gel was calcd. as a function of the degree of swelling, and found to be in good agreement with the results obtained by other methods of detg. the pore size. This newer conception of the cellulose gel structure is discussed from the viewpoint of H.'s previous findings on the elasticity of swollen hydrate cellulose gels (C. A. 32, 1923). The force-tension curves of swollen and isotropic cellulose threads are brought to a clearer understanding and the theoretical considerations of the new structure concept are discussed. Thirty-three references."—Chem. Abs. 32: 4775.

423. KOETS, P., and KRUYT, H. R. Bemerkungen über die hydratation hydrophiler kolloide, insbesondere der polymeren kohlenhydrate. Kolloid Ztschr. 82: 315-318. Mar. 1938. 384 Z315

"A discussion with no exptl. data. In order to det. whether a substance is a hydrophilic or hydrophobic colloid the cohesive forces of the constituent mols., as well as the presence of polar groups that act as centers of hydration, must be taken into consideration. In the series of polymeric carbohydrates (glucose-glycogen-amylose-cellulose) the hydration forces are greater than the cohesion forces in short-chain mols., and the substance is molecularly dispersed; the cohesive forces are very great in long-chain mols. and the substance remains undissolved; the cohesion and hydration forces are in equil. in mols. of medium chain length and the substance is colloidally dispersed to form a hydrophilic sol or gel. The hypothesis that the hydration water is intramicellarly bound in the hydrophilic colloidal particle leads to a better explanation of the characteristic properties of this group of colloids than the schematic picture of the particle completely surrounded by a film of the bound water."—Chem. Abs. 32: 4044.

424. KRISCHER, O. Grundgesetze der feuchtigkeitsbewegung in trockengütern. Kapillarwasserbewegung und wasserdampf-diffusion. Ver. Deut. Ingin. Ztschr. 82: 373-378. Mar. 1938.

"From math. considerations and exptl. results a theory of capillary action is developed. The distribution of moisture in porous materials may be visualized by assuming capillary forces within bundles of capillaries of steadily increasing width. A coeff. of moisture conduction, similar to the coeff. of heat cond. or the coeff. of diffusion, can exist only in case of horizontal moisture movement. It is a function of the moisture and the distribution of capillaries. Its value approaches zero with min. moisture. It may assume infinite value depending on the distribution of capillaries. It depends greatly on the temp. The limiting condition for the moisture level in drying operations is derived and an equation for persistency, based on moisture cond. and diffusion, is given."—Chem. Abs. 32: 4411.

425. LLOYD, D. J. Imbibition of water by proteins. Cereal Chem. 15: 25-34. 1938. 59.8 C33

"Proteins imbibe water and hold it in 2 different forms which may be distinguished as loosely bound and firmly bound water. The amt. of total H_2O bound varies with the activity of the H_2O in the system. The loosely bound H_2O falls with decreasing activity of H_2O until the latter falls to about 0.7. At lower activities 0.7 to 0.2 only the firmly bound H_2O is present which remains const. in amt. over this range. Below an activity of 0.2 the firmly bound H_2O is given up. The loosely bound H_2O can be removed by freezing, by direct pressure or by evapn. The forces holding loosely bound H_2O are the interionic forces arising from the multipolar nature of the protein amphoteric ion. It is suggested that the forces holding the loosely bound H_2O are chem. in nature and are due to the formation of a coördinate link or H bond between the H_2O mols. and the O and N atoms of the protein. It is suggested that the presence of direct carbonyl-imino linkages between polypeptide backbones of adjacent mols. such as occur in fibers, reduces the amt. of closely bound H_2O. The significance of these results in animal and plant physiology is indicated."—Chem. Abs. 32: 3426.

426. MORRISON, J. L., CAMPBELL, W. B., and MAAS, O. The heats of adsorption of alkalis by standard cellulose. Canad. J. Res. Sect. B, Chem. Sci. 16: 195-202. June 1938. 330.9 C16C

"The heats of adsorption of aq. NaOH, KOH and LiOH, and some salt solns. by cotton cellulose have been measured. The adsorption of alkali by cellulose seems to be ionic rather than mol.; more particularly, it appears to be closely related to the availability of the H ion from the very weakly acidic cellulose, and of the OH ion from the electrolyte."—Chem. Abs. 32: 7717.

427. FRITSCH, A. Comments on the osmotic theory of swelling. Internatl. Soc. Leather Trades Chem. J. 23: 601-617. 1939. 303.9 So12

"Math. Some deficiencies in the Procter-Wilson theory (cf. C. A. 11, 113) are pointed out. The Sørensen-Michaelis theory of ampholytes is applied to protein solns. The osmotic theory can explain all the phenomena occurring in the swelling of proteins, including swelling in pure H_2O."—Chem. Abs. 34: 3155.

428. HEERTJES, P. M. Dichtheidsbepalingen als hulpmiddel by het vezelonderzoek. Chem. Weekbl. 36: 610-611. 1939. 385 C42

"An examination of the cotton in He-H_2O mixts. shows that part of the adsorbed H_2O (6.25%) is actually fixed in the cellulose lattice, and the remainder (about 20%) is adsorbed on the surface in the usual manner."—Chem. Abs. 34: 4565.

429. HENRY, P. S. H. Diffusion in absorbing media. Roy. Soc. London, Proc., Ser. A. 171: 215-241. 1939. 501 L84A

"A math. investigation of the problem of diffusion of one substance through another in the pores of a solid body which adsorbs and immobilizes some of the diffusing substance. The evolution of heat which accompanies the absorption process affects the absorbing power of the solid. The problem arose in connection with the uptake of moisture by cotton bales, but the theory is also applicable to the case of a dissolved substance diffusing through a gel."—Chem. Abs. 34: 3560.

430. MAASS, O., and CAMPBELL, W. B. Studies in cellulose - moisture phenomena. Pulp and Paper Mag. Canada 40: 108-114. 1939. 302.8 P96

"Cellulosic fiber is considered as a network of branching crystals with many 'faults' or open spaces between the elements; the essential point of the concept is that the cryst. nature of cellulose lies in the regular spacing of the C_6 groups rather than in the arrangement of the long mols., though some degree of regularity in the arrangement of the chains must follow. Results of expts. on the sorption of water and org. liquids by cellulose, heat of wetting, d. or specific vol., dielec. const. and specific heat of cellulose, are discussed and explained in the light of the above concept of cellulose structure."—Chem. Abs. 33: 4017.

431. PEIRCE, F. T., and LORD, E. The fineness and maturity of cotton. Textile Inst. J. 30: T173-T210. Dec. 1939. 73.9 T31

"The fineness of cotton, an important factor in spinning quality, depends on the perimeter of the fibre and the extent to which this is filled out with cellulose. Perimeter depends mainly on the variety of cotton but thickening on climate and other conditions of growth. It is important to be able to isolate these genetic and climatic factors but direct measurements of perimeter and thickening are too tedious for practical purposes. Hair weight per cm. and immaturity count as determined in the B.C.I.R.A. stapling tests are related dimensions that can be readily measured and the present investigation deals with the relationship between them and geometric dimensions of the fibre that could be ascertained from cross-sections. A correlation between hair weight, H, and immaturity count (N - D) (difference between percentage of 'normal' and 'dead' fibre), is established by measurements on samples of cotton from bolls picked at successive dates from 25 to 60 days after secondary thickening had set in, and similar data for several varieties are shown to be consistent with the same relation between H and (N - D). It is proposed, therefore, to obtain a 'standard hair weight,' H_S, which would strictly reflect the genetic factor of the perimeter, by referring hair-weights to that arbitrary, optimum state of immaturity provided by the soil and climate of Egypt, for which (N - D) is taken as (67 - 7)=60. The relation between the true and

431. PEIRCE, F. T. (Cont.)
standard hair weights and the immaturity count is given by the equation $100H/H_S = 0.5 (N - D) + 70$. Other relations are established between H_S and dimensions actually measured on cross-sections. The data, from a wide range of material, are treated statistically throughout."—Textile Inst. J. 31: A150.

432. TOBLER, F. Zur theorie und praxis des wasserabstossendmachens von baumwolle und bastfasern. Klepzig's Textil-Ztschr. 42: 185-186. Mar. 15, 1939.
A review.

433. BRUNAUER, S., DEMING, L. S., DEMING, W. E., and TELLER, E. A theory of the van der Waals adsorption of gases. Amer. Chem. Soc. J. 62: 1723-1732. July 1940. 381 Am33J

"The isotherm equation derived in a previous paper for the multimolecular van der Waals adsorption of gases has been extended to cover two additional cases: (1) when the heat of adsorption in the first layer is smaller than the heat of liquefaction, (2) when the capillaries of the adsorbent are completely filled, the heat of adsorption in the last layer is greater than the heat of liquefaction. The new equation covers all the five types of adsorption isotherms found in the literature. Comparison is made with experimental data and with the capillary condensation theory."—Author's summary.

434. CASSIE, A. B. D. Propagation of temperature changes through textiles in humid atmospheres. II. Theory of propagation of temperature change. Faraday Soc. Trans. 36: 453-458. 1940. 382 F22

"Theoretical. The propagation of heat and water vapor concn. changes through textile materials is examd. when the air-water vapor mixt. flows through under an applied pressure difference. The flow is propagated with a fast and a slow component, the phys. significance of which is discussed. An example is presented in which one half of the total temp. change passed through the textile with the same speed as the air; and the remainder at roughly 2.5×10^{-4} times this speed."—Chem. Abs. 34: 4276.

435. CASSIE, A. B. D. Regain of textiles and humid atmosphere changes. Textile Inst. J. 31: T17-T30. Feb. 1940. 73.9 T31

"The long time frequently required for a textile material to reach equil. with an atm. of changed relative humidity is due to the large amt. of H_2O to be gained or lost relative to the H_2O content of an equal vol. of air, and to the high latent heat. When a textile is dried by the passage through it of warm air of low relative humidity equil. is established almost instantaneously between the fibers and the air immediately surrounding them, but this involves little change in the H_2O content of the fiber. The passage of a large vol. of air is required to remove the excess of H_2O and to supply the latent heat. Similar considerations apply to conditioning and account for the effect of clothing in diminishing atm.-temp. variations. Methods of calcn. are given."—Chem. Abs. 34: 6821.

436. FOWLER, J. L., and HERTEL, K. L. Flow of a gas through porous media. J. Appl. Phys. 11: 496-502 1940. 334.8 P563.

"Well-known theories of gas flow are discussed and a method of applying them to (textile) fibers is described. Exptl. results obtained with cotton, wool, rayon and glass-wool fibers are given, and are in good agreement with those obtained from independent detns. The hydrodynamic method using air seems to be well adapted to the detn. of the sp. surface of fibrous materials."—Chem. Abs. 35: 677.

437. MARK, H. Intermicellar hole and tube system in fiber structure. J. Phys. Chem. 44: 764-788. 1940. 381 J822

"A crit. summary of the implications of recent X-ray diffraction and optical studies of the structure of cellulose, including some comparisons with rubber. Phys. properties are correlated with the degree of crystallinity. 118 references."—Chem. Abs. 34: 5655.

438. SISSON, W. A. X-ray studies regarding the structure and behavior of native cellulose membranes. Chem. Rev. 26: 187-201. 1940. 381 C425

"Three concepts regarding the structure of cellulose are the micellar theory, the continuous-structure theory and the cellulose-particle theory. Except for the size and shape of the particles, the essential features of the micellar and particle theories are identical. Also, the interpretation of X-ray diffraction data on the basis of the 2 concepts is essentially the same. The interpretation differs in that the identification of the cellulose crystallite with the micelle is founded on the existence of a hypothetical building unit, while the cellulose particle is a unit whose existence can be demonstrated by microscopic observation. In identifying the cellulose crystallite with the particle, the only assumption necessary is one which will account for the width of the X-ray diffraction lines. If it is assumed that the particle has a continuous but imperfect cryst. structure so as to account for the width of diffraction lines and the porosity of the particle to chem. reagents, then the major X-ray arguments for the existence of submicroscopic micelles in natural fibers cease to exist. The present data would indicate that the existence of cryst. cellulose particles sepd. by amorphous interparticle material is adequate for explaining those X-ray data pertaining to cellulose membrane structure. This interpretation enables one to make a more direct correlation between X-ray and microscopic data without contradicting other phys. and chem. data which point to the existence of a dual structure. All of the chem. data which indicate the pre-existence of well-defined micelles in native fibers rest upon acts of disruption and are th therefore open to suspicion. The methods of viscosity, the ultracentrifuge, diffusion coeffs., osmotic pressure, total surface and methylation are useful for estg. the av. size of the 'micelle' or 'mol.' as it exists in soln., but unless one is certain of what happens during the soln. process it is difficult to extrapolate the results to untreated native cellulose membranes. The conclusion that it is unnecessary to assume a cryst. unit smaller than the cellulose particle in order to explain the X-ray data does not discredit the important role which cellulose chain mols. or a further secondary structure of the particle may play in the interpretation of many chem. and phys. data, but merely emphasizes the fact that both microscopic and submicroscopic structures may play an important and often interrelated part in the behavior of native cellulose membranes."—Chem. Abs. 34: 4563.

"Swelling" treated under section on "Effect of various treatment on the X-ray diagram" and "Explanation of the effect of various treatments on the basis of the cellulose particle."

439. *CENTOLA, G. [The relations between structure and properties of fibers. I. Deformation and tearing of natural cellulose fibers.] Bologna. Università Facoltà di Chimica Industriale, Bollettino Scientifico. 1941: 1-6.

"Expts. were conducted to explain the tear mechanism of natural cellulose fibers and their resistance to tearing in the moist state. A considerable portion of the cellulose of the fiber is not a part of the crystal lattice. This amorphous portion, however, is intimately joined to the cryst. part; the amorphous macromols. protrude from the crystal lattice. A sliding of independent micelles cannot be considered to be the cause of tearing on the basis of this theory. The tearing load agrees well with the data calcd. by Meyer and Mark. The resistance to tearing and the stretch are given for natural mercerized, nitrated and acetylated cotton in the dry state and after treatment with water, alc. and CH_3OH. In agreement with Sakurada's data, C. found that as long as esterification causes no change in the structure of the fiber, it has also no influence on the resistance to tearing; this again excludes the possibility of the sliding of macromols. as the cause of the tearing. Mercerized cellulose has a higher resistance to tearing, as mercerization increases the content of amorphous cellulose. From this C. concludes that during the tearing of the fiber the amorphous macromols., and thus the chain linkages of glucoside radicals, are split. The increase of the resistance to tearing caused by water is explained by the theory that water, like all other liquids, which cannot enter the crystal lattice, causes the amorphous zone of the fiber to swell and thus helps the macromols., which have become more mobile, to become oriented more readily during tension. During mercerization under tension cellulose acquires its max. resistance to tearing, as under this condition the largest no. of micelles become orientated."—Chem. Abs. 37: 3275.

440. GAVORET, J. G. Phenomenes d'adsorption sur la cellulose. Ann. de Chim. 15: 97-186. 1941. 383 An7c

"Theories of the structure of cellulose and of its swelling are summarised. The adsorption on cellulose from dil. aq. salt solutions of various concns. has been studied at room temp. and at various pH vals. Heavy and hydrolysable cations tend to adsorb as hydroxides or to undergo exchange with H^+ ions of the cellulose, confirming its acidic nature. For adsorption of Pb^{++} there is a threshold at pH 2.8 below which no adsorption occurs. Adsorption of heavy cations is accompanied by preferential adsorption of H_2O but does not cause simultaneous adsorption of anions. a-Cellulose has an adsorption threshold at pH vals.> for cellulose and evidence is produced to indicate that the adsorptive capacity increa:e creases with depolymerisation and decreases with condensation."—Brit. Chem. Abs. A, I, 1942: 324.

441. *HERMANS, P. H. [The mechanism of deformation and the fine structure of hydrated cellulose. XVII. The course of orientation as a function of the degrees of extensibility and of swelling.] Kolloid-Ztschr. 96: 38-41. 1941.

"Every degree of extensibility in the swollen state (v) can be referred to an experimentally detd. characteristic degree of extensibility in the dry state (v_t). This relationship is expressed by $v_t = [1/(1+L)]\ q^1/3.v$, in which L is the longitudinal swelling of the stretched fiber, and q is the degree of swelling of the isotropic fiber (i.e., the ratio of the vol. of the swollen fiber to the vol. of the dry fiber). Provisionally, the results of the X-ray studies are not at variance with v_t relationships obtained from optical and extensibility measurements. For degrees of extensibility that are not too small, they are in good agreement. Strength-extensibility diagrams using v_t as a measure of extensibility were easily plotted. The results require a revision of the views held hitherto on the mechanism of deformation and swelling in which the interpretation of v_t leads to difficulties."—Chem. Abs. 36: 5643.

442. *HERMANS, P. H., and PLATZEK, H. [The mechanism of deformation and the fine structure of hydrated cellulose. XX.] The high extensibility of cellulose gels. Kolloid-Ztschr. 96: 329-335. 1941.

"On the basis of general concepts regarding the course of syneresis it was concluded that the extensibility of isotropic cellulose threads must reach a definite max. value depending on the degree of swelling. Precise extensibility measurements were made with isotropic cellulose threads that had been conditioned over a mixt. of glycerol-H_2O having a known relative vapor tension. Actually a max. extension was found between the degrees of swelling (q) 1.3 and 1.4, corresponding to a H_2O content of 25% by weight. The max. extensibility ($v_{max.}$) is 3, which corresponds to 200%. With higher degrees of swelling, the extensibility again decreased, approx. in inverse ratio to $q^1/3$. This leads to the conclusion that, during the course of the extension, no true flow obtains, but rather a deformation of the netlike structural framework. When the degree of stretch was referred to the dry state (v), it was shown that for all values of q above 1.5, the stretch to the point of rupture remained const. at approx. 240% and that only when the degree of swelling dropped below this point, did the extension decrease sharply. Double refraction along the extended thread varies, this variation being greater for low than for high degrees of swelling. The regions of greater double refraction correspond to the thinner portions of the thread. For all degrees of swelling from the dry state with q=1.19 to the conditioned state, with q = 2.10, the vol. remains const. With water-swollen threads, where q=2.5, the vol. passes through a max. With greatly swollen threads (q=5.5) the vol. decreases steadily, a finding in harmony with concepts on the mechanism of deformation."—Chem. Abs. 36: 5644.

443. HOCK, C. W., RAMSAY, R. C., and HARRIS, M. Microscopic structure of the cotton fiber. U. S. Natl. Bur. Standards. J. Res. 26: 93-104. Feb. 1941. 157.88 J82

Also in Amer. Dyestuff Rptr. 30: 53-60, 75-76. 1941. 306.8 Am3; Textile Res. 11: 200-217. 1941. 304.8 T293

"The secondary wall forming the bulk of the cotton fibre, comprises spirally oriented cellulose fibrils, enclosed in a winding formed spirally in the reverse direction. The directions of both fibrils and winding reverse at frequent intervals along the axis of the fibre, the points of reversal being coincident. The secondary wall is enclosed in a thin primary wall composed of crossed cellulose strands embedded in a membrane containing wax and pectic material. The lumen also contains wax and pectic material together with degenerated protoplasm. On treatment with $Cu(OH)_2$ -NH_3 reagent immature fibres swell relatively little, and the wax and pectic substance retain the tubular shape of the primary wall, but older fibres swell abruptly, causing breaking of the primary wall in many places and the formation of 'balloons.' This irregular swelling seems to depend on the orientation of the fibrils and on the constricting influences of the winding of the primary wall. Treatment of the fibre with the Cu reagent diluted with conc. aq. NH_3 shows a lamellate structure in the secondary wall, the no. of lamellae increasing with increasing age of the fibre."—Brit. Chem. Abs. A,III, 1941: 542.

444. SCHRAMEK, W., HELM, J., and STENZEL, A. Die quellung regenerierter cellulosefasern aus viscose in wasser und alkalien. Cellulosechemie 19: 5-15. 1941. 309.8 C33

"It is not sufficient to det. simply tensile strength, stretch to the point of rupture and elasticity, in studying the practical usefulness of rayon cellulose. These must be correlated with other data, such as swelling properties (especially in aq. NaOH). A microscopic method for detg. the swelling of regenerated cellulose fibers is described in detail and illustrated, and the solid geometry of swelling and data for 'swelling no.' are fully discussed, together with various sources of error in measuring min. and max. diams. in swollen fibers. Since swelling appears to be correlated with thread cross-section, it is essential to analyze swelling measurements by use of the so-called (denier) titer-swelling measurement diagrams, some of which are reproduced in the original article. Threads of greater titer often show lesser swelling nos. than do those of smaller titer. Swelling in NaOH is influenced by preliminary swelling in H_2O, by the concn. of the NaOH soln. (being greatest usually in 9% NaOH), by techniques used in spinning, etc."—Chem. Abs. 36: 4332.

445. STAMM, A. J., and MILLETT, M. A. The internal surface of cellulosic materials. J. Phys. Chem. 45: 43-54. 1941. 381 J822

"Values for the internal surface of cellulosic materials have been calculated from published data for (1) adsorption of gases and vapours, (2) selective adsorption from solution, (3) heats of swelling, and (4) adhesion tension, and also from new data on selective adsorption. These and other values taken from the literature fall into two groups. Systems in which the cell wall is not swollen give surfaces of about 2×10^3 sq. cm. per gram, whereas systems in which the cell walls are swollen give surfaces of about 3×10^6 sq. cm. per gram. The former measure only the microscopically visible surface, whereas the latter measure the surface of the transient capillary structure created within the cell walls by the swelling agents."—Textile Inst. J. 32: A186.

446. BABBITT, J. D. On the adsorption of water vapour by cellulose. Canad. J. Res. Sect. A, Phys. Sci. 20: 143-172. Sept. 1942. 330.9 C16C

"An attempt is made to collect the best available data on the adsorption of water vapor by cellulose and to draw from these data a unified picture of the phenomenon. The various theories of the adsorption isotherm are tested. The Langmuir isotherm fits a small portion of the curve at low relative humidities, and the multi-mol. theory of Brunauer, Emmett and Teller (C. A. 32, 4037) agrees up to the point where capillary adsorption is assumed to become predominant. The assumptions involved in the theory of Brunauer, Emmett and Teller, however, are such that an equally satisfactory agreement might be obtained by assuming that the adsorption was confined to a unimol. layer in which, owing to repulsive forces between neighboring atoms, the adsorbing force varied with the no. of atoms. Thus it is still doubtful whether the adsorption is unimol. or multimol. Adsorption on cotton is similar to that on wood, except for the fact that internal surface area available for adsorption is less by a factor of 1.86. Data available for calcn. of the heats of adsorption are analyzed, and the values obtained from the different sources are compared. When the heats of adsorption are plotted against the relative humidity there is no appreciable difference between the values obtained with cotton and with wood. A mean value for the heat of adsorption is obtained. The relation between heat of adsorption and the latent heat of condensation is developed. There is an excess of internal energy in the adsorbed state over that of the liquid state. Finally, an explanation is advanced to account for the exptl. fact that there is a reduction in total vol. when water vapor is adsorbed on cellulose. An attempt is also made to show (a) how the water mol. may be attached to the cellulose surface by hydrogen bonds in such a way that the energy will be greater than that in liquid water, and, (b) that, on the basis of such a picture, a vol. contraction is to be expected."—Chem. Abs. 37: 16.

447. BARKAS, W. W. Wood-water relationships. VII. Swelling pressure and sorption hysteresis in gels. Faraday Soc. Trans. 38: 194-209. 1942. 382 F22

"The outstanding difference between solutions and gels is that the former can withstand only hydrostatic pressures, whereas the latter can also resist shear stresses. As a result it is shown that the pressures exerted by gels when prevented from swelling freely are

447. BARKAS, W. W. (Cont.)
different from those exerted by solutions, and exact equations are derived for the swelling pressure of a gel at both constant and varying moisture contents. In cases where the natural swelling induces shear stresses in the gel, it is proved that, if the material be plastic, hysteresis in the (vapour pressure; moisture content) isothermal must result, and it is suggested that plasticity may be the cause of this well-known phenomenon."—Author's summary.

448. HEERTJES, P. M. The density and sorptive capacity of some samples of cotton, silk and wool. Part IV. Some remarks on the sorption of water by cotton, silk and wool. Rec. des Trav. Chim. des Pays-Bas. 61: 751-762. 1942. 385 R24

"The d. of a hydrophil fiber in water is considered theoretically. The true vol. of water held by 1 cc. of dry fiber is $1 + (q'/100) = d_h [(p/s) + (1/d_w) + (1/d_h) - (1/d_b)]$, where q' = vol. increase by water taken up minus the vol. of the non-accessible pores of the fiber as detd. by sorption with benzene d_h, d_w, d_b = the densities of the fiber in He, water and benzene, s = d. of water and p = g. of water adsorbed per g. of fiber substance. At first the water mols. enter the outer layers of the fiber. Then the water intake continues by adsorption on the inner and outer fiber substance without any noticeable change in vol. Finally the water is taken up by capillary condensation in the pores of the fiber, still without any noticeable change in vol. The absorbed water affects the detn. of the d. of the fiber in water, but not the adsorbed water and water taken up by capillary condensation. For cotton and silk dyed and undyed fibers take up the same quantities of water. The affinity of wool for water is increased appreciably by dyeing and felting."—Chem. Abs. 38: 3137.

449. ILLINGWORTH, J. W. The swelling of textile fibres. Textile Rec. 60(715): 44-46. Oct. 1942. 304.8 T311

"The moisture content of cotton is influenced by various degrees of acetylation. The low-moisture content affects the elec. resistance of the fiber and acetylated cotton has a much greater insulating power than the untreated fiber. The work of others on the swelling of fibers is indicated in curves and tables."—Chem. Abs. 37: 263.

450. LAUER, K. Zur kenntnis der cellulosefasern. 2. Mitteilung: Die relative nassfestigkeit von cellulosefasern. J. f. Makromol. Chem. 1: 97-105. Aug. 1943.

"Differences in the wet strength of natural and regenerated cellulose fibers may be a result of chain length, crystal lattice arrangement or fibrous structure (e.g., spiral and vertical orientation of the fiber elements). The relative wet strength of Am. and Egyptian cottons and ramie which had been mercerized with and without stretching were detd. to 100-25% of the dry strength (i.e., values close to those for unmercerized fibers) also for cotton degraded with aq. HCl for 6 hrs. at 55° and that mercerized prior to degradation. the fact that the relative wet strength of the last 2 was nearly the same (about 100%) indicates that the value is not influenced by the crystal lattice arrangement or the chain length. The wet strengths for viscose rayon fibers before and after reversion to the native form (heating with ethylene glycol and tetrahydrofurfuryl alc.) were 52-7.5%; this indicates that polymorphism is not responsible for the wet strength. The abs. breaking length of rayon fibers increased with increasing degree of stretching but the relative wet strength remained practically unchanged. No relation could be established between the degree of orientation and the magnitude of the relative wet strength. It is concluded that it is impossible to increase the relative wet strength of regenerated cellulose fibers to any extent merely by stretching. For regenerated fibers the breaking length did not decrease until the moisture content was above the adsorption limit, whereas for cotton the value increased with increasing moisture content within the adsorption range and then became const."—Chem. Abs. 38: 1355.

453. BULL, H. B. Adsorption of water vapour by proteins. Amer. Chem. Soc. J. 66: 1499-1507. Sept. 1944. 381 Am33J

"The results are given of investigations on the weight of water vapour adsorbed by a series of purified proteins studied as a function of the aqueous vapour pressure at 25° and 40° C. and also of the free energy changes and the heat changes. The theory of multilayer adsorption as proposed by Brunauer, Emmett and Teller (J. Amer. Chem. Soc. 1938, 60, 309) satisfactorily describes water adsorption by proteins. The present results are consistent with the view that protein molecules in the solid state are linked together to form coherent planes whose exposed surfaces are hydrophilic, water being adsorbed between these planes."—Textile Inst. J. 36: A49.

454. GLUCKAUF, E. Permeability of adsorbing substances. Nature [London] 154: 831-832. 1944. 472 N21

"The adsorption of water vapor by keratin and by cellulose is explained by assuming 2 or more states of adsorption, in which the adsorbed mols. have markedly different mobilities. Then Fick's law applies, not to the adsorbed total, but only to the concn. of the mobile part, which attains appreciable values only at higher concns. of total water. Similar phenomena can occur even when no swelling occurs."—Chem. Abs. 39: 1097.

455. HERMANS, P. H. Sur la quantité de matière cristallisée dans la cellulose régénérée, (Communication préliminaire). Rec. des Trav. Chim. des Pays-Bas. 63(1-2): 13-24. Jan., Feb. 1944. 385 R24

"The degree of orientation can be calcd. from the X-ray pattern. The specific birefringence for a fiber can be calcd. by assuming it to be composed entirely of cryst. matter. The observed specific birefringence of ramie is very nearly equal to that of cryst. cellulose but is very small. This shows that the fibers contain only a fraction of cryst. matter in addn. to a considerable amt. of amorphous matter which itself contributes equally to the total birefringence. The observed values permit only an est. to be made of the max. amt. of cryst. matter, and indicate that it is something between 20 and 30%."—Chem. Abs. 39: 1584.

456. HERMANS, P. H., HERMANS, J. J., VERMAAS, D., and WEIDINGER, A. Volume relations in the system cellulose-water. (Preliminary communication). Rec. des Trav. Chim. des Pays-Bas. 63: 44-45. 1944. 385 R24

"A brief review of d. and X-ray data leads to the conclusion that the d. of cellulose in water, rather than that in other media, must be regarded as the true d. D. is a typically macroscopic concept which must be replaced by considerations involving the packing of spheres when systems of mol. dispersion are discussed."—Chem. Abs. 39: 1585.

457. HERMANS, P. H., VERMAAS, D., and HERMANS, J. J. Studien im system cellulose-wasser. I. Über die raumverhaltnisse im system cellulose-wasser und über die packungsdichte der cellulosefasern. J. f. Makromol. Chem. 1: 247-290. Oct. 1944.

"On the basis of exptl. data obtained with isotropic viscose rayon 'model' filaments, an attempt is made to prove that H_2O may be regarded as the ideal displacement medium for d. detns. in place of He. ... A modified concept of the distribution of H_2O within the hollow spaces of the fiber is offered and is used to interpret the d. data derived from the X-ray analysis. ... Although the author's modified concept is in agreement with the assumption that the H_2O in a moist cellulose fiber is located within its amorphous regions, X-ray data are interpreted to show that, in cellulose hydrate, a small portion of the H_2O is taken up by the cryst. region. ... The degree of chain packing in the cellulose fiber, which dets. the d., may be derived from pore-vol.data; it is smaller for mercerized and regenerated than for native fibers, in agreement with the assumption that the amorphous portion is larger in the former than in the latter. Thus, the d. may become an expression for the ratio of amorphous to cryst. material in cellulose fibers and filaments."—Chem. Abs. 40: 201.

458. LAUER, K. Zur kenntnis der zellulosefasern. 7. Mitteilung: Über den faserbau. Kolloid Ztschr. 107: 93-103. May 1944. 384 Z315

"The paper, which is mostly speculative, deals particularly with the dry and wet strength of native cellulose and cellulose hydrate fibers as measured in H_2O and org. liquids. An explanation for the different behaviors of the various types of fibers toward different immersion liquids is attempted on the basis of 2 assumptions. (1) The native cellulose fiber is conceived as being built up of spiral ribbons composed of lamellas, representing the cryst. portion of the fiber, with the amorphous portions between the spiral ribbons; the lamellas are considered as composed of fibrils which run parallel to the fiber axis. In contrast, cellulose hydrate fibers are pictured as lacking the spiral ribbon arrangement, the cryst. and amorphous portions being arranged at random. (2) Hermans' β-glucopyranose model (cf. C. A. 38, 248) is considered, in which the HO groups are located on one side of a plane and are believed to be projected parallel to the fiber axis through the anhydroglucose ring, whereas the H atoms are located on the other side of the plane. The behavior of various fibers on freezing at —150° is considered. Cotton fibers show no loss in tensile strength, whereas staple fiber loses from 10 to 40%. The swelling ability of the cotton increases, that of the staple fiber decreases."—Chem. Abs. 39: 183.

459. LAUER, K., and WESTERMANN, U. Zur kenntnis der zellulosefasern. 6. Mitteilung: Zur bestimmung der dichte der zellulose in verschiedenen medien. Kolloid. Ztschr. 107: 89-93. May 1944. 384 Z315

"The d. of cellulose (I) is influenced by the mol. forces which operate between its HO groups and certain groups of the displacement media in which the measurements are made. This influence is small when H_2O is used, because only small changes occur when the intramol. attraction between the HO groups of the dry I shifts to the mol. attraction between the latter and the HO groups of the H_2O. It is claimed that the d. of I in H_2O (which the authors find to be 1.6) equals its theoretical (i.e.,crystal) d. (which is said to be 1.6 also) and is thus unaffected by the presence in the fiber of noncryst. I. Consequently, the measurements in H_2O show no difference for native and cellulose hydrate fibers. In contrast, the influence of the mol. forces between I and the displacement medium is appreciable if the latter is an org. liquid (e.g.,higher alcs.,$CHCl_3$, acetone, benzene or toluene). In these cases the fact that the d. of I in any displacement medium is not identical with that of I alone, but with that of the system I-displacement medium becomes more pronounced. The d. values in the org. liquids are all lower than those for H_2O. This difference is said to be a result, not of a vol. contraction in the I–H_2O system (hitherto held responsible for the higher values in H_2O), but of lyophilic sorption of the org. liquid by I. The same hypothesis is used to explain the fact that the ds. measured in org. liquids are lower than those obtained in He. The hitherto held opinion—that this difference is the result of the inability of the relative large mols. of the org. liquids to fill the interstices of the fiber completely—is therefore discarded."—Chem. Abs. 39: 183.

460. MODERN knowledge of textile fibres: Optical properties. From a technical correspondent. Silk J. and Rayon World 20(246): 46, 48. Nov. 1944. 304.8 Si3

Common textile fibers are anisotropic; they are longer than they are wide; stronger in the direction of the long axis than across their width. When fibers swell in water or other liquids, there is a much greater increase in width than in length; some, in fact, increase in width and decrease in length. Swelling of fibers in general elucidated by X-ray investigation, in addition to the type of swelling which involves dispersion of the cellulose and a distension of the lattice, X-ray methods have shown that swelling with water alone involves no change in the lattice. Hence water only penetrates between the micelles and not into them. No references.

461. NUTTING, P. G. The retention of fluids by solids. Franklin Inst. J. 238: 177-184. Sept. 1944. 470 J82

"A general relation between energy of retention, pressure and temperature has been developed by thermodynamic methods, applicable even to cases where that energy varies with the amount of fluid present. The three classes of experimental data on adsorption are reviewed, their interpretation in the light of thermodynamic theory is discussed, and relations between energy of change and phase and amount of fluid retained are deduced. Research necessary to clear up the whole field of fluid retention by solids from pure liquid to pure solid is indicated."—Author's summary.

462. BARKAS, W. W. Swelling stresses in gels and the calculation of the elastic constants of gels from their hygroscopic properties. Gt. Brit. Dept. Sci. and Indus. Res. Forest Prod. Res. Spec. Rpt. 6, 62 p. London, 1945. 99.9 G796S

"The fundamental relations connecting v.p. with applied hydrostatic pressure have been derived for solutions and extended to include rigid gels at const. and varying moisture content. The dependence of swelling pressures on the elastic consts. of gels has been considered for gels subjected to hydrostatic pressure only and for gels held under pressure in a cylinder or between parallel plates. The effect of similar applied stresses on the sorption isothermal has also been considered. Methods of measuring the elastic consts. of gels by means of mechanical tests and methods relying on changes in hygroscopic properties are reviewed and discussed. Tests of derived equations based on swelling properties, which have been made on wood, give vals. of the correct order of magnitude. Sorption hysteresis of gels, in which the v.p. of a gel depends on whether equilibrium is reached by adsorption from a lower or by desorption from a higher moisture content, is shown to be due to internal shear stresses set up during swelling. ..."—Brit. Chem. Abs. A,I 1945: 336.

463. CASSIE, A. B. D. Absorption of water by wool. Faraday Soc. Trans. 41: 458-464. Aug./Sept. 1945. 382 F22

"The theory of water absorption by textile fibres has varied from the solution hypothesis of Katz to the capillary pore theory as applied by Hedges to wool, and Peirce's theory that part of the water is localised at certain units in the fibre with a large heat evolution, whilst the remainder fills the spaces available under attractive forces like those in a liquid without heat evolution. Peirce's theory is now the most commonly accepted one for textile fibres and Speakman has recently applied it to an analysis of the absorption isotherm of wool. Peirce established his theory by an evaporation-condensation mechanism, and although it is plausible from this point of view, it requires considerable explanation when examined thermodynamically. The most important feature of the absorption of water by textile fibres is that they absorb large quantities of water when exposed to water vapour pressures less than the saturation vapour pressure for pure water; they have, in fact, a water vapour pressure isotherm... It is shown that the water vapour pressure isotherm of wool is greatly influenced by the hydrostatic pressure on the sorbed water due to the mechanical properties of the fibres. An isotherm reduced to one hydrostatic pressure is given, and it does not show the sigmoid inflexion of the experimentally observed curve. An investigation of the absorption-desorption hysteresis of wool suggests that this is largely due to the mechanical hysteresis of the fibres. The isotherm reduced to one hydrostatic pressure is analysed using the theory of multimolecular absorption. Agreement of the theory and experimental observations is excellent, and it is shown that there is on the average 1.12 mol. of low energy sites per 100 g. of wool. This is close to the number of mols., 1.11, of CO-groups per 100 g. of wool, and it is suggested that the CO-groups are primarily the water attracting groups in wool. The heat of absorption of water on to the sites is 3500 cal. per mol."—Author's introduction and summary.

464. CASSIE, A. B. D. Multimolecular absorption. Faraday Soc. Trans. 41: 450-458. Aug./Sept. 1945. 382 F22

"A general statistical method is given for dealing with the problem of a single species of molecule which may assume either of two forms in a single phase. The molecules may interchange between the two forms to give a free energy of interchange or mixing, and the distribution of the molecules between the two forms is determined by the condition that the total free energy of the phase should be a minimum. The method is applied to multimolecular absorption which takes place (a) in the presence of localised sites, or (b) on to a mobile monolayer. The equation deduced for the absorption isotherm with localised sites is identical with that deduced by Brunauer, Emmett and Teller using an evaporation-condensation mechanism, although a more precise interpretation of the parameters in the equation is now possible. The equation represents a sigmoid curve which is concave to the pressure axis at low pressures. It is shown that a mobile monolayer must be gaseous to give an absorption isotherm or to give surface absorption which varies with the concentration of the solute in the solution. The isotherm for multimolecular absorption with a gaseous monolayer is everywhere convex to the pressure axis. The absorption of water vapour by carbon seems to be the one example of this type of absorption which has been fully established by experiment. The empirical isotherms agree excellently with the equation derived theoretically. Heat is absorbed when water molecules pass from water in bulk to the monolayer, the value per mol. being 2200 cal. The area covered by the gaseous film is also estimated."—Author's summary.

465. HEERTJES, P. M. Volume relations in the system cellulose-water. Rec. des Trav. Chim. des Pays-Bas. 64: 52-53. 1945. 385 R24

"Some of the conclusions of Hermans, et al. (C. A. 39, 1585) are questioned. The expts. do not prove that the true d. of cellulose is found in water, but rather that water is not adsorbed under compression by cellulose. The closest approximation to the true d. of a porous material is found in He. Reply. P.H.Hermans (Utrecht). Ibid, 53-4 (in English)"—Chem. Abs. 40: 786.

466. PAULING, L. The adsorption of water by proteins. Amer. Chem. Soc. J. 67: 555-557. Apr. 1945. 381 Am33J

"The data published by Bull (C. A. 38, 6156) and Shaw (C. A. 38, 6153) on the adsorption of water by proteins

466. PAULING, L. (Cont.)
are in considerable degree interpreted on the assumption that the initial process is the attachment of one water mol. to each polar amino acid side chain. The data also indicate that peptide carbonyl and imido groups usually do not bind water, because of their mutual interaction by H-bond formation, but that water is bound by carbonyl groups that are not coupled by H bonds with imido groups. In salmin, in which most of the amino-acid residues are polar, these polar residues coöperate to attach one water mol. jointly to 2 polar groups in the initial process of hydration."—Chem. Abs. 39: 2240.

467. HERMANS, P. H. Contribution to the physics of cellulose fibres, a study in sorption, density, refractive power and orientation. 221 p. Amsterdam, New York [etc.] Elsevier Pub. Co., 1946. (Monographs on the progress of research in Holland during the war. 3) 304 H42

468. HERMANS, P. H., HERMANS, J. J., and VERMAAS, D. Optical properties of the system cellulose-water (A contribution to the optics of swollen gels). J. Colloid Sci. 1: 251-260. May 1946. 381 J828

"The refractive index of moist isotropic model filaments conforms quantitatively to Gladstone and Dale's rule for mixtures. This also applies to the two refractive indices in ramie and in anistropic model fibers below approximately 15% regain. At high moisture contents discrepancies occur, which are probably due to a structural birefringence in Wiener's sense. This Wiener component, however, is considerably smaller than that calculated for cellulose rods immersed in water. The results obtained are in accordance with the picture of water absorption arrived at in our earlier work. The absorption of water in cellulose essentially represents the formation of a homogeneous binary mixture of water and the amorphous portion of the fiber substance (in which hydrate formation may play a rôle). It should not be considered as due to a surface action of a colloidal structure."—Author's summary.

469. HERMANS, P. H., and WEIDINGER, A. The hydrates of cellulose. J. Colloid Sci. 1: 185-193. Mar. 1946. 381 J828

"It is shown that the formation of true hydrates plays a part in the process of moisture absorption in cellulose fibers. The existence of two hydrates, called hydrate I and hydrate II, can be derived from X-ray data. Crystalline hydrate I is formed when cellulose II (the modification of 'mercerized' cellulose) is exposed to water vapor and hence this modification, in contrast to current statements in the literature, exhibits so-called 'intramicellar' swelling. Cellulose I (native modification) does not show this phenomenon. Crystalline hydrate II is identical with the 'water cellulose' of Sakurada and Hutino. It is formed when other cellulose compounds containing water are decomposed at low temperature. The lattice constants of both hydrates are given in Table II. If their composition be expressed by $C_6H_{10}O_5.pH_2O$ the value of p is most probably 1/3 or 1/2 in hydrate I and 1 1/3 or 1 1/2 in hydrate II. The point of view is adopted that the crystalline part of fibers consisting of cellulose II takes part in the process of sorption by the formation of hydrate I, whereas crystalline cellulose I does not. In the amorphous part of the fiber both hydrates are always formed if sufficient water is absorbed."—Author's summary.

470. MACMILLAN, W. G., MUKHERJEE, R. R., and SEN, M. K. The moisture relationships of jute. Part I. Adsorption isotherm and heat of wetting. Textile Inst. J. 37: T13-T24. Feb. 1946. 73.9 T31

"Current theories on the moisture adsorption isotherm and heat of wetting of fibres, with special reference to jute, have been reviewed, along with their inter-relationships. Adsorption and desorption isotherms have been determined for samples of tossa (C. olitorius) and white jute (C. capsularis). The effect of heat on the moisture affinity of the fibres has been studied, and a tentative explanation given for the difference in hygroscopicities found with tossa and white jute and also with normal and heated jute. The heats of wetting of jute, wool and cotton have been measured, and an explanation suggested for the differences obtained. The increased hygroscopicity of jute relative to cotton is attributed to the presence of a group or groups in the lignin, xylan and other hemicelluloses with a greater affinity for moisture than the alcoholic hydroxyl groups in cellulose itself. The heats of adsorption of jute have been calculated from Shorter's formula, and the heats of wetting computed therefrom found to agree with those experimentally determined."—Author's summary.

UTILIZATION OF SWELLING IN FABRIC

471. JARRELL, T. D., and HOLMAN, H. P. Effectiveness of materials used for waterproofing canvas, and their influence on the fabric. Textile World 73: 3103, 3105. 1928. 304.8 T315

"Samples of canvas variously treated and exposed to the weather for 6 months showed the following decreases in strength: untreated, 39%; treated with 85% yellow petrolatum and 15% beeswax, 90%; with raw sienna added to the petrolatum and beeswax treatment, 23%; with burnt umber incorporated, 19%; treated with boiled linseed oil, 65%; with burnt umber added to the linseed oil, 47%; with Al bronzing powder added to linseed oil, 18%; with lampblack added to linseed oil, 13%; and treated with paraffin, 81%. Thus the oily, greasy or waxy waterproofing materials tried, with the exception of some bituminous materials, increased the rate of deterioration in strength. The loss was always much less with pigments than without them. If dark colors and a greasy finish are unobjectionable, bituminous materials are recommended. For light finishes, a mixt. of beeswax with petrolatum or amorphous mineral wax in the ratio of 1 to 4 is satisfactory. Drying oils, such as linseed, may be used for canvas in a fixed position where air permeability is unnecessary. Paraffin is an unsatisfactory waterproofing agent chiefly because of its cryst. structure. Other objections are that it melts in warm weather; it causes rapid loss in strength on exposure to sunlight; and it increases susceptibility to mildew when conditions are favorable. Methods of applying bituminous materials and the best treatment for paulins, light-weight tent fabrics and awning materials are discussed. The water resistance of the fabrics was rated according to the amt. of H_2O passing through a filter composed of the fabric folded with absorbent paper and placed in a glass funnel."—Chem. Abs. 22: 2844.

473. GREGORY, J. The transfer of moisture through fabrics. Textile Inst. J. 21: T66-T84. Feb. 1930. 73.9 T31

"The purpose of this investigation was to examine the means by which water vapor evapd. from the body reaches the outside atm., and to det. the resistance to this transfer of moisture by fabrics of varying construction. The test method consists of measuring the rate of escape of water vapor into the air-conditioned room from a shallow dish covered with one layer of fabric, the water in the dish being maintained at the desired temp. by a water bath. Fabrics differing widely in construction have rates of moisture transfer within a comparatively small range. The permeability of fabrics to air was also detd. and the relationship of this property to the ventilating powers of the fabric is discussed."—Chem. Abs. 24: 4937.

474. MARSH, M. C. Some notes on the permeability of fabrics to air. Textile Inst. J. 22: T56-T63. Jan. 1931. 73.9 T31

"A method of measuring air permeability similar to that of Sale and Hedrick (Bur. Standards, Tech. Paper No. 266) was used. Results for many different types of fabrics are given. When a fabric is milled, its permeability to air decreases markedly."—Chem. Abs. 25: 5035.

475. MATTHEW, J. A. Comparison of some fabric testing methods. Textile Inst. J. 22: T497-T532. Nov. 1931. 73.9 T31

"The purpose was to compare the results by various methods of fabric testing for serviceability with actual service behavior. No one test alone dets. the serviceability of a cloth under all conditions; measurements of tensile strength, warp and weft, % extension at break and resistance to wear by rubbing furnish a basis for predicting serviceability. For the samples tested, the tensile strength and the resistance to wear by rubbing tests on warp specimens of cloth gave results which were in the same relative order as the results on the number of washes to cause wear."—Chem. Abs. 26: 1449.

476. MATTHEW, J. A. The testing of linen fabrics from the point of view of their uses. Textile Inst. J. 23: P113-P121. June 1932. 73.9 T31

"A discussion of durability tests, tests of personal appeal, tests of body comfort and miscellaneous serviceability tests. A bibliography of 24 references is included."—Chem. Abs. 26: 5211.

477. URQUHART, A. R., BOSTOCK, W., and ECKERSALL, N. The moisture relations of cotton. VIII. The effect of processing. Textile Inst. J. 23: T135-T149. July 1932. 73.9 T31

"A piece of cloth was passed through the normal routine of a bleachworks; after the kier-boil it was divided into 2 parts, one portion being bleached, the other being mercerized and bleached. The resulting materials were dyed with 4 typical dyes. Samples of the materials were examd. at each stage of the processing by methods previously described. The hygroscopicity decreased slightly but steadily with increase in duration and in temp. of drying. The adsorptive capacity possessed immediately after the mercerization process was impaired continuously as the material was dried down the primary desorption curve. The hygroscopicity of cotton was reduced somewhat by chem. attack. The reduction was small except where the attack was so serious as to cause almost complete loss of strength."—Chem. Abs. 26: 5424.

478. LENHER, S., and SMITH, J. E. The evaluation of textile penetrants; an improved centrifugal method. Amer. Dyestuff Rptr. 22: 689-692, 717-719. Nov. 20, 1933. 306.8 Am3

"An improved method is described for evaluating the textile penetration assistants. The advantages of this method as compared with sinking-time methods for quant. evaluation of wetting-out agents are pointed out. It is shown that surface tension of a soln. toward air is no criterion of its penetrating abilities toward textile fibers. Measurements of the efficiency of a variety of textile assistants as penetrating agents over a range of concns. and temps. are given."—Chem. Abs. 28: 4242.

479. SMITH, W. C. An accelerated aging test for waterproofed ducks and similar fabrics. Amer. Dyestuff Rptr. 22: 114-118. Feb. 13, 1933. 306.8 Am3

"Relative waterproofness can be computed by inserting the material under examn. onto the side of a cast Fe box, one end of which is closed by the sample. The sample is held in place by a heavy cast Al frame secured by wing nuts. The bottom of the clamping frame is provided with a trough for delivering the H_2O which exudes through the sample to a vessel where it is measured. The box is filled to overflowing with H_2O which is kept at a const. level. Waterproofness is computed by the quantity of H_2O passing through the fabric per unit of time, by the hydrostatic pressure required to produce leakage and by the distribution of the leak drops on the cloth. Accelerated aging is induced by exposing the fabric to light, alternate wetting and drying and mech. flexing and distortion."—Chem. Abs. 27: 2584.

480. BLACK, C. P., and MATTHEW, J. A. The physical properties of fabrics in relation to clothing. Part II. Water vapour permeability of fabrics. Textile Inst. J. 25: T225-T240. July 1934. 73.9 T31

"The method employed for permeability measurement is by determining the loss in weight, from time to time, of a 0.5% solution of saponin contained in a suitable vessel, the top of which is covered with the fabric and sealed round the edges. Conditions of temperature, relative humidity and air movement are all controlled. The figure taken as best expressing permeability is the ratio E_f/E_w where E_f is the rate of evaporation, in gms. per hour, from a dish covered with the fabric, and E_w is that from an exactly similar dish which is uncovered, both rates being obtained in the same experiment. This method of expressing permeability gives a figure which is approximately independent of the surrounding air conditions. Permeabilities are given for a series of linen fabrics of graduated openness of weave, each with several different surface states, and a number of fabrics of somewhat similar structure made from different textiles. Permeabilities are also given for a series of wire gauzes. Results show only a slight decrease of permeability with increasing closeness of weave. A similar effect is shown by the gauzes. Woven materials, in the finished, loom-state and laundered states have permeabilities increasing in that order. The mesh fabrics give the greatest permeabilities. The order of increasing permeability was found, in the mesh fabrics tested, to be wool, cellular cotton, cotton mesh, linen mesh, artificial silk mesh. Permeability is roughly proportional to porosity and inversely proportional to apparent density for the woven fabrics. In the mesh fabrics, the factors having the greatest influence on permeability would seem to be the hairiness of surface and the yarn interspaces. The conclusion drawn is that since the vapour permeability shows only very small changes with considerable variation in the nature and structure of the underclothing material, it can have but very small influence upon moisture removal from the body, and therefore cannot be accepted as a criterion of the suitability or otherwise of such a material for its purpose."—Author's summary.

481. HESS, K., and REIDHEIMER, D. The determination of absorption of wear (!) by fabrics. Amer. Dyestuff Rptr. 23: 715-716, 743. Dec. 31, 1934. 306.8 Am3

"Methods for measuring the absorbency of fabrics are compared. The cosin (capillary rise) method is not regarded as accurate. With certain changes in technique and under controlled conditions of relative humidity and temperature, Haven's method is convenient and satisfactory for fabrics other than knitted goods. Details of the suggested changes in technique are given. Where controlled conditions of relative humidity and temperature cannot be maintained, the wet surface method (with suggested modifications) is recommended as an accurate means of obtaining both rate and amount of absorption of moisture by all types of fabrics. The suggested modifications include the substitution for the usual brick of a 10-inch unglazed porcelain disc. This disc becomes saturated with moisture in a few minutes and an even surface moisture can be maintained during the test by keeping the disc in a pan of water."—Textile Inst. J. 26: A212.

482. PRESTON, M. H., and MATTHEW, J. A. Absorption of water by linen. Part II. Fabrics. Textile Inst. J. 25: T371-T390. Dec. 1934. 73.9 T31

"Three methods for measuring absorbency were studied: a wet-surface method which requires very careful attention to exptl. conditions; a sinking test, which does not appear reliable for comparing the absorbency of very different fabrics and gives no information on the water-holding capacity (it is suitable for comparing the efficiencies of wetting-out agents on a standard cloth); and the dipping method previously used for yarns, which appears to be the most reliable and easily carried out method. With it, measurements of completeness of wetting and of water held after dipping and after mangling can be carried out on one sample. Results obtained on samples in the loom state and in finished and laundered conditions are discussed in detail. The completeness of wetting of laundered, plain woven, bleached linen is negligibly affected by yarn twist. The percentage of water held after dipping shows a steady decrease from a max. at a certain yarn twist, but this difference is not shown after mangling. Cloth made from tow yarn holds more water both after dipping and after mangling than cloth from line yarn. The closeness of the weave, or compactness of the cloth, has no effect on the completeness of wetting but does affect the percentage of water held. Similarly the size of the yarn and the type of weave, both of which affect the compactness of the cloth, have no effect on the completeness of wetting, but do affect the water-holding capacity. In general, these effects are less pronounced after mangling. The effect of changing the no. of yarns per inch is expressed by the relation: (P - 50) n=const.; where P is the percentage of water held and n is the no. of yarns per inch, warp or filling, with const. filling or warp, resp. The completeness of wetting depends to a very large extent on the cleanliness of the fiber surface, especially as regards freedom from fatty materials. Wetting is complete with fully bleached cloth; also, the water-holding capacity and the amt. of water expressed on mangling are greater so that it dries more quickly than cloth not fully bleached."—Chem. Abs. 29: 3168.

483. FOURT, L., and others. Textile testing in Germany. U. S. Off. Pub. Bd. P. B. 3883, 21 p. Washington, D. C., 1945. (U. S. Off. Mil. Govt. for Germany. Off. Dir. Intel. Fiat Final Rpt. 466) 157.8 R29

B. A. Holgate, C. W. Schoffstall, F. M. Steadman, and A. M. Viditz-Ward, joint authors.

Testing of fabrics, p. 8-10. Includes determination of swelling quantitative and determination of swelling by dyeing.

484. BUNDESMANN, [H]. Uber das verhalten wasserabstossend imprägnierter oberkleidung. Monatschr. f. Textil Indus. 51(III): 78-80. 1936. 304.8 L53

"A fabric can be made impervious to water by impregnating its surface with a tight layer which closes all its pores, thus lowering its porosity and permeability to

484. BUNDESMANN, [H]. (Cont.)

air. The maintenance of porosity, however, is necessary in all clothing for hygienic reasons. By means of 'imprägnol' it is possible to make fabrics quite impervious to moisture and lower its absorptive power for water without decreasing its porosity. The effect of this impregnating agent was tested experimentally by a no. of persons who wore treated and untreated top clothing in rains. The results of these practical tests showed that the impregnation of top clothing with this medium decreased the absorptive power of the fabrics to such an extent that (1) the clothing preserved its shape in the rain, (2) dried more quickly than the untreated clothing, (3) maintained its permeability to air even after the rain and (4) increases only slightly in wt. B. believes that these results justify the impregnation of top clothing, thus increasing its quality and value."—Chem. Abs. 31: 1217.

485. COOK, A. A., and ZAPARANICK, J. Spray test for evaluating water repellency. Amer. Dyestuff Rptr. 26: 323-325. June 14, 1937. 306.8 Am3

"A simple test, capable of semiquant. results consists of spraying a weighed piece of the fabric processed with a water-repellent compd. under carefully controlled conditions and then re-weighing to det. the amt. of moisture which has been absorbed. Advantages claimed for the app. are: (1) it approximates practical conditions, (2) it is capable of semi-quant. results and (3) it is simple and inexpensive. Details of manipulation are given."—Chem. Abs. 31: 5587.

486. KOBER, P. Die gewebedichte. Melliand Textil Ber. 18: 36-37. 1937. 304.8 T312

"The density or closeness of a fabric is defined as the ratio of the area covered by the constituent yarns to the total area. A method of calculating fabric densities from the diameters and numbers per cm. of the warp and weft yarns is explained, and a table showing the diameters of cotton yarns of different counts is given. The densities of various types of cotton fabrics are given."—Textile Inst. J. 28: A278

487. MARSH, F., and BUXTON, P. A. Measurements of temperature and humidity between the clothes and the body. J. Hyg. [London] 37: 254-260. 1937. 449.8 J82

"Temperature and humidity measurements have been made between the clothes and the body on a subject wearing European clothes as adapted for indoor wear in the tropics and working in a laboratory in Persia where summer maxima are 124-127° F. and the winter minimum below 32° F. The recorded data comprise the temperatures and 'saturation deficiences' in the room and beneath the shirt. The saturation deficiency is calculated by deducting the vapour pressure of the air from the saturation vapour pressure at air temperature, and is therefore a direct measure of the drying power of the air and also a measure of the evaporative cooling power of the air on a sweat-covered body or on the respiratory membrane. It was found that although great variations in both temperature and saturation deficiency were recorded in the room during the two seasons, there was very little change in either quantity as measured under the clothes, and the running of a fan in the room appeared to have little effect."—Textile Inst. J. 29: A302.

488. MECHEELS, O. Über die substantivität einiger textilhilfsmittel. Melliand Textil Ber. 18: 103-104, 165-167, 312-313. 1937. 304.8 T312

"The substantivity is measured by the weight increase of the fiber. Several org. assistants were studied at various temps. up to 100°. The influence of pH and conditions affecting the addn. of coarsely dispersed assistants, used in waterproofing are considered."—Chem. Abs. 31: 6891.

489. PEIRCE, F. T. The geometry of cloth structure. Textile Inst. J. 28: T45-T96. Mar. 1937. 73.9 T31

"If measurements of cloth structure are presented as a number of absolute length measurements, such as for example, thread spacings and diameters, the geometrical form of the structure and the extent of its similarity to other structures, is not immediately evident. If, however, one such measurement be chosen as a basic length merely to show the scale of the structure, and if all the other measurements are then expressed as ratios relative to it or to each other, then similarities or differences of geometrical form stand out clearly and geometrical analysis has a general validity, which is independent of the scale. Physical studies may then proceed from geometry by the use of physical constants of the material and laws describing the effect of scale or absolute dimension. To link up the usual weight units of textiles with geometrical analysis, quantities based on the inverse square root of the yarn counts are suggested. The ideal geometry of the plain weave is given, first by rigorous formulae in terms of the angles of bending and the lengths of the interweaving threads... It is shown that the flattening of the threads and their rigid resistance do not seriously disturb the application of geometry to cloth analysis...Dimensional changes observed in experiments on fabrics are analysed into three components due to yarn length change, swelling of thread section or flattening thereof, and crimp redistribution. A canvas was stretched by various amounts warp and weft-way and the relations between length and breadth observed are compared with theory, also the changes in thickness..."—Author's summary.

Article divided into four parts as follows: I, "Geometrical similarity" is treated under headings specific volume, cover factor, crimp, weight, twist factor and breaking length; II, "The geometry of the plain weave" deals with crimp-spacing relation, applicable formulae, special structures, crimp interchange, and modes of attack on various problems; III, "Deviations from the simple geometry" includes sections on compression of threads, twills and matt weaves, and crimped form of an elastic thread; IV, "Practical illustrations and examples" deals with cover factors in commercial fabrics, dimensional changes in a canvas, analysis of shrinkage, balance of crimp in shrunk plain cloths, crimp balance in the loom state, and extension and tensile test of flax canvas.

490. LAFOREST, P. La mesure de l'imperméabilisation d'un tissu. TIBA, 16: 615, 617, 619, 621. Nov. 1938.

"Various methods of testing waterproofed fabrics are critically discussed. Suitable methods are classified into soaking methods, pressure methods, and sprinkling methods and are briefly described."—Textile Inst. J. 30: A127.

491. LINDENMAIER, R. Some aspects of water repellency. Amer. Dyestuff Rptr. 27: P286-P289. 1938. 306.8 Am3

"The development of waterproofing processes is traced briefly, also the practical methods now employed. Wax emulsions contg. Al formate or Al acetate as fixative are now employed. The Al salt may be a constituent of the proofing agent or added separately. Each type has certain advantages. The means employed of waterproofing various types of fibers and fabrics are outlined, also methods of testing waterproofed goods. Goods should be conditioned at least 24 hrs. after processing before testing for proofing effect. Longer storage, a week or 2, still further improves the repellency. Two methods of testing are employed. The pressure test in which the cloth is fixed at the end of a cylinder, and water is gradually allowed to run into the cylinders until a first drop pierces through the cloth. Then the water inlet is turned off and the height of the water column is measured. The drop test is carried out with the material at an angle of 45° and allowing the water to drop on it from a height of 6 in., at the rate of 90 drops a min. For heavy goods a cone large enough to hold a half pint of water is held in the cone. No drop should show through within 48 hrs."—Chem. Abs. 32: 5635.

492. COLLINS, G. E. Fundamental principles that govern the shrinkage of cotton goods by washing. Textile Inst. J. 30: P46-P61. Mar. 1939. 73.9 T31

"Shrinkage may occur when fabrics become wet because of swelling and release of strains. Data showing the effects on shrinkage of degree of wetting, temp. and compn. of the bath, agitation, conditions of running of washing machine, temp. of drying, mangling, ironing and successive washings are presented. Models to illustrate cloth and yarn shrinkage are described."—Chem. Abs. 33: 7576.

493. FERGUSON, A. Determination of wetting coefficients. In International Society of Leather Trades' Chemists. Wetting and detergency. Ed. 2, p. 11-17. New York, Chemical Pub. Co., 1939. 386 In82

"Calculation of values of the coefficients which are needed in any quantitative consideration of wetting or detergency."—Chem. Abs. 34: 2098.

494. FERGUSSON, H. T. The testing of the waterproofness of fabrics. Textile Inst. J. 30: T99-T102. June 1939. 73.9 T31

"An improved 'drop test' is described."—Chem. Abs. 33: 8022.

495. *KJELLSTRAND, S. [Some methods for determining the solidity of yarns and the possibilities of their application.] Skand. Tidskr. f. Textilindus. 37: 6-8, 31-35, 92-94. 1939.

"A review on some fundamental ideas and on methods for detg. homo-and inhomogeneity, tensile strength, energy and extensibility of yarns, for continuously testing long yarns, and for finding av. values of the solidity of cotton, flax, jute, worsted and rayon yarns."—Chem. Abs. 34: 8289.

496. KOBER, P. Über den einfluss der bindung auf die gewebestruktur. Melliand Textil Ber. 20: 337-342. 1939. 304.8 T312

"The influence of the nature of the weave on fabric structure is discussed and its effect in plain weave, 1/2, 2/2 and 1/3 twills, 5-shaft sateen, and 3/3 twill is examined. It is pointed out that when the same yarns are used and the same warp and weft densities, the closeness and strength of the fabric structure decrease in the order named. ..."—Textile Inst. J. 30: A516.

Closeness is an important consideration in the designing of self-sealing (by swelling) fabrics.

497. PESCHEL, F. M. Testing the wettability and evaporation rate of fabrics. Rayon Textile Monthly 20: 72. Jan. 1939. 304.8 R21

Also in Amer. Dyestuff Rptr. 28: P61-P62. 1939. 306.8 Am3

"An app. and test procedure are outlined for detg. the ability of a fabric or a garment to absorb moisture and evap. it so that perspiration will be absorbed and dispersed through the fabric."—Chem. Abs. 33: 1952.

"In a test devised for the determination of differences in the rate of absorption by and evaporation from various types of treated and untreated fabrics in contact with the human body under conditions of excessive perspiration, the loss in moisture through evaporation from the surface of a fabric, which is continuously supplied with moisture, is determined at intervals. A circular test section of the fabric is clamped over the mouth of a Thwing-Albert Vapometer, stiffening rings of bond paper being used to support the fabric if necessary. The Vapometer cup contains 25 c.c. of distilled water and a wick made from blotting paper and supported in a vertical position in the centre of the cup by an aluminium cylinder. Weighings of the whole system are made in rapid succession on a chainomatic balance with fractional weights regulated from the exterior of the balance case so that the case door may remain closed as much as possible. To compare two samples, the results are plotted in graph form, plotting the evaporation loss in grams against time in minutes."—J. Textile Inst. 30: A260.

498. POWNEY, J. The penetration of fabrics by detergent solutions. In International Society of Leather Chemists. Wetting and detergency. Ed. 2, p. 185-196. New York, Chemical Pub. Co., 1939. 386 In82

Includes general principles involved in the penetration of fabrics by water.

499. RATH, H. Das wesen des krumpfens und die krumpffreie ausrüstung. Melliand Textil Ber. 20: 497-502, 582-584, 658-660. 1939. 304.8 T312

"The relationship between swelling of textile fibers (usually with water) and the shrinkage of textiles is discussed with diagrams. Methods of rendering textiles shrinkproof, e. g., by sanforizing, are reviewed."—Chem. Abs. 34: 8293.

500. STIEGLER, H. W., and HOOD, J. M. Water repellency and temperature. Amer. Dyestuff Rptr. 28: P285-P287. May 29, 1939. 306.8 Am3

"The temp. of the water used in evaluating water-repellent finishes is important and comparative tests should be made with accurate control of the water temp. The usual tests for evaluating water repellency are outlined. The spray test is described and a set-up illustrated. Results are tabulated for 4 wax-type products and for 2 permanent types. Cloth construction, yarn and twist have a definite influence on the degree of water repellency."—Chem. Abs. 33: 5193.

501. KLINGELHOFER, A., MENDRZYK, H., and SOMMER, H. Die prüfung von textilien auf wasserdichtigkeit und wasserabweisende eigenschaften; ein beitrag zur normung. Wiss. Abhandl. deut. Materialprüfungsanst. [n.s.] 1(4): 1-41. 1940. 304 K68

"A comprehensive summary of the whole field is given with definition of terms and a crit. review of the known methods of testing these properties. Results of practical testing on various materials are reported. Two standards are recommended: testing for water-tightness by the water-pressure method and testing the property of shedding water by the spray method. These 2 properties are distinguished from one another. A rapid immersion method is also given for checking impregnations designed to turn water. 55 cuts are given."—Chem. Abs. 36: 6813.

502. STEIN, L. Hygienic and technical aspects of water-repellent clothing. Amer. Dyestuff Rptr. 29: 352-355. 1940. 306.8 Am3

"In a comparison of porous, water-repellent cloths with simply dyed nonwaterproofed cloths, almost no difference was observed as to the amt. of water permeating the cloth under the same condition. The behavior and treatment of waterproofed cotton clothing during use are noted. Whitish spots sometimes observed on clothing after heavy rain, especially where intense rubbing has occurred, were found to be due to the damage done to the structure of the cotton fiber. If the fiber is slit, a brightening takes place, due to the destruction of the fiber with inclusion of air. The spots may occur on waterproofed and on unwaterproofed piece, yarn or fiber-dyed goods, with vat and other dyes. The addn. of AcOH to the rinsing bath prevents the formation of insol. Ca and Mg compds. and the pptn. of Al compds. introduced into the cloth through waterproofing with them. Where the Al-compd. water-proofing agents have withstood the org. solvent during dry cleaning, a rinse of 1 oz. soap to 3 gal. of water at 49-54.4° produces new water-repellent substance from the interaction of the soap and the pre-existing Al. A luke-warm water rinse, followed by one contg. a little AcOH and hot ironing with a wet cloth, restores much of the waterproofness. A proposed treatment of long-worn clothing is as follows: The piece is treated with cold water contg. some AcOH or vinegar, drained and dried by heat followed by hot ironing. Al acetate or formate may be added to the AcOH-water mixt."—Chem. Abs. 34: 6087.

503. *LAGOV, A. F. [Testing the waterproofness of textile fabrics.] Tekstil'naia Promyshlennost. No. 3, p. 51. 1941. 304.8 T23

"Two app. for testing the waterproofness of tent materials in a mill are described. The 1st consists of a framed plate upon which is placed a dry filter paper which has been steeped in Na_2CO_3 soln. The material to be tested is placed upon the filter paper. Water contg. a little phenolphthalein is then dropped from a pipet upon the material from a height of 1 m. The other app., a so-called 'Penetrometer', consists of a container tightly covered with the material to be tested which is connected on both sides to 2 tubes. The operation of the Penetrometer is described. The use of both app. is recommended because of the simple construction and ease of operation."—Chem. Abs. 37: 6136.

504. MENDRZYK, H. Wasserdichtigkeit und wasserabweisende eigenschaften von textilien. I-III. Deut. Textilwirtschaft. 8(2): 3-10; (3): 5-9; (4): 3-9. 1941. 304.8 D483

"A general discussion of waterproof and water-repellent impregnations with definitions of the terms 'waterproof' and 'water-repellent.' The various methods of testing for both of these properties were critically checked."—Chem. Abs. 37: 6904.

505. STEIN, L. Tent materials and allied fabrics. Amer. Dyestuff Rptr. 30: 621-627, 639. 1941. 306.8 Am3

"Results of tests under field conditions to det. efficiency of waterproofing compds. and products used, with particular reference to effect of moisture conditions due to condensation and weave of cotton duck employed."—Chem. Abs. 36: 2728.

506. LAWRIE, L. G. The waterproofness of fabrics permeable to air. [Tentative textile standard no. 7, 1942.] Textile Inst. J. 33: S49-S52. Oct. 1942. 73.9 T31

"An introductory review of the work of the Sub-Comm. for Tests of Water-Proofness of Fabrics Permeable to Air followed by the specification for a Bundesmann-type water-repellency testing machine, which is the app. unanimously agreed upon as offering the best prospect of being suitable for a standard method of testing. The machine is a continuous-shower type. The fabric to be tested is clamped over a test cup provided with small arms for wiping the underside of the fabric during test."—Chem. Abs. 37: 5252.

507. WOOD, P. J. Cotton fabric constructions in relation to water resistance. Amer. Dyestuff Rptr. 31: P6-P12. 1942. 306.8 Am3

"A cooperative research involving a study of more than 50 constructions of treated cotton fabrics (mill processed specially under controlled conditions throughout) at present found in the water-resistant cloth market, from the viewpoint of construction and water resistance when subjected to various types of water-resistance tests. The constructions include twills, poplins, gabardines, broadcloths, etc., which were subjected to the following tests: (1) immersion, (2) spray, (3) impact penetration, (4) rubbing penetration, (5) hydrostatic pressure and (6) air permeability (Gurley). Tests 1 and 2 are used to show the water resistance of the fibers and yarns, irrespective of fabric construction. Tests 3, 4, 5, and 6 are essentially penetration tests and are therefore closely re-

507. WOOD, P. J. (Cont.)
lated to construction. A method for experimentally predicting the suitability of construction was found. The protection which may be expected from a fabric after proper water-resistant finishing can be accurately foretold in less than 30 sec. by means of an airporosity test on the untreated fabric."—Chem. Abs. 36: 2728.

508. SLOWINSKE, G. A. Water-resistant fabric utility. Amer. Dyestuff Rptr. 32: P85-P91. 1943. 306.8 Am3

"A new impact penetration tester for water-resistant fabrics designed to measure the amt. of water penetrating a fabric under dynamic pressure is described. The sample is clamped on a stand inclined at 45° and over a weighed piece of blotting paper. Five hundred ml. of water is sprayed upon the sample from an av. height of 24 in. and the blotting paper quickly removed and weighed to the nearest 0.1 g. Results of tests on 50 different fabrics by this method are given along with hydrostatic pressure and air-permeability data. Fabrics used were all processed in the same manner and in the same plant under controlled conditions, differing only in construction. All samples rated 100 in water-repellency by the A.A.T.C.C. spray test. The results demonstrate that data from wetting tests (spray and immersion) and hydrostatic pressure tests should be combined with that of impact penetration tests to obtain a complete over-all picture of a water-resistant fabric."—Chem. Abs. 37: 5251.

509. SOOKNE, A. M. The problem of water-repellent fabrics. Textile Research Institute, Inc. Symposium on the functional properties of clothing fabrics, p. 12-15. New York, 1943. 304 T319S

510. BREEN, J. R. New water-repellent cloth use in army clothing seen. New York, Daily News Rec., 121, p. 13, May 23, 1944. 286.8 N48

Specification tables are given.

511. CASSIE, A. B. D., and BAXTER, S. Wettability of porous surfaces. Faraday Soc. Trans. 40: 546-551. Dec. 1944. 382 F22

"The difficulty of wetting rough porous surfaces is attributed to the large apparent contact angle between the liquid and the surface. Formulas are derived relating the apparent contact angles to the total areas of solid-liquid interface and of liquid-air interface. Exptl. confirmation was obtained when the formulas were applied to data obtained with a wire grating, the wires of which were coated with a thin film of paraffin wax. Water rolls off a duck's back owing to the structure of the feathers rather than to any exceptional proofing agent. The structures of water-repellent clothing are discussed in general, and it is suggested that research on water-repellency of clothing should be directed to perfecting an appropriate cloth structure rather than a sole search for an improved water-repellent agent."—Chem. Abs. 39: 2444.

512. GOLDTHWAIT, C. F. Cotton yarn for water-pressure hose. U. S. Pat. No. 2,352,707, July 4, 1944.

"1. A hose having a water-holding wall comprising a fabric woven from cotton yarn which is substantially non-stretching, said yarn having hydroxy ethyl cellulose incorporated therein, which cellulose derivative is non-soluble in water and which swells when wetted, whereby the hose when used to carry water under pressure is substantially non-expansible and waterproof."—U. S. Patent Office Off. Gaz. 564(1): 55. July 4, 1944.

513. HOCK, C. W., SOOKNE, A. M., and HARRIS, M. Thermal properties of moist fabrics. U. S. Natl. Bur. Standards, J. Res. 32: 229-252. 1944. 157.88 J82

Also in Amer. Dyestuff Rptr. 33: 206-219. 1944. 306.8 Am3

"The 'chilling' effect produced by moist fabrics of various fibre compositions and constructions when in contact with the body has been evaluated by subjective tests, by measuring the fall in temperature which ensued when the moist fabrics were placed on an artificial 'skin' surface, and by tests with a moisture-sensitive paper designed to measure the extent of contact which the fabrics made with a surface. Fabrics which produced considerable chilling in subjective tests were found to make good surface contact and to cause a substantial drop in skin temperature. Conversely, fabrics which caused little or no chilling effect made poor surface contact and the accompanying drop in temperature was relatively small. The results show clearly the progressive improvement of the fabrics with respect to chilling as their wool content is increased. In this respect the use of wool fibres, which are highly crimped and possess long-range elasticity, permits the construction of a type of fabric in which the extent of contact with the skin is minimised. Special types of construction, especially those which produce a napped surface, appreciably lessen the contact which even wet cotton fabrics make, and thereby lessen the chilling effect. Hence in selecting fabrics for warmth, especially for wearing next to the skin in cold climates and under conditions where considerable perspiration is produced, the significant factor is the type of contact the fabrics make with the body."—Soc. Dyers and Colourists J. 60: 320.

514. JEFFERIS, H. Finish seen essential to Shirley cloth repellency. New York, Daily News Rec. 168, p. 4. July 19, 1944. 286.8 N48

"The possibility that Shirley type cotton cloth might prove satisfactory for protection against rain without being treated ... is regarded with some skepticism in the chemical trade."

515. PEIRCE, F. T., and GARDINER, W. C. Woven structure resistant to penetration by water under pressure. U. S. Pat., No. 2,350,696, June 6, 1944; Brit. Pat. No. 549,974, Dec. 6, 1941.

"Water pressure resisting fabrics, such as, for example, canvas fire hose, are produced either wholly from specially treated and prepared cotton yarns in both warp and weft, or alternatively from such cotton warp yarns in conjunction with weft of flax, ramie or hemp. The special treatment of the cotton yarns consists in mercerisation under high tension followed by drying under tension at an elevated temperature. The cotton yarns are prepared in the spinning and subsequent twisting processes with lower degrees of twist than are normally employed in ordinary work. They may be subjected to a scouring or wax-removing treatment. The cotton warp yarns may be impregnated with a water-soluble adhesive or pure size. The yarns and/or the woven fabrics are impregnated with a mould-inhibiting agent. The yarns are woven under considerable tension into a fabric or very dense structure."—Textile Inst. J. 34: A126.

516. RAYON FINISHER [pseud.] Creping. Part 1. Silk J. and Rayon World 20(246): 42-43, 58. Nov. 1944. 304.8 Si3

"In this article the author deals with the fundamental principles of creping, the use of crepe yarns in various types of fabrics, and the finishing treatments required for the different types of crepes."—Author's summary.

The following data refer to increases in area of cross-section of fibres (assuming a circular cross-section) in passing from the conditioned state at approximately 60% R.H. to the swollen state in liquid water.

	INCREASE IN CROSS-SECTIONAL AREA
Silk	46%
Wool	35%
Cotton	30%
Viscose	35-60%
Acetate	6-9 %

No references.

517. BAXTER, S., and CASSIE, A. B. D. The water repellency of fabrics and a new water repellency test. Textile Inst. J. 36: T67-T90. Apr. 1945. 73.9 T31

Subject treated under following topics: Surface tension and contact angles; porous surfaces; textile surfaces; wetting of fabrics in rain; wetting test; pressure required to force water into yarns and through fabrics; weathering trials of water repellent fabrics.

An analysis is made of the properties measured by different water repellency tests and the results are compared with mechanism by which rain is absorbed by a fabric. A new apparatus designed to measure a fundamental property of rain resistant fabrics is described. Results obtained using this test, together with a study of natural water repellent surfaces, such as ducks' feathers, have shown clearly that the conventional water repellent fabric has a structure far from ideal. The theoretical ideal structure for a water repellent surface is explained.

518. FULTON, G. P. Water impedient treatment and re-treatment of clothing fabrics. Amer. Dyestuff Rptr. 34: P95-P98, P104. Feb. 26, 1945. 306.8 Am3

Swelling is increased by low yarn twists. Lowering of the twist in Navy Jungle Cloth increased the resistance to water several times. Shirley Institute cloth (patent ref. only) is superior to other fabrics of comparable weight. The interstices were almost completely closed.

519. GOLDTHWAIT, C. F., and SMITH, H. O. Water-tight fabrics made by swelling cotton fibers. Textile World 95(7): 105, 107, 196, 198. July 1945. 304.8 T315

"A new method for making a water-holding cotton fire-hose [developed at the U. S. Southern Regional Research Laboratory] without the use of a rubber lining involves the addn. to the yarn before weaving of a swellable finish-

519. GOLDTHWAIT, C. F. (Cont.)
ing material, not soluble in water, to supplement the swelling of the cotton and thus to produce a self-sealing fabric. The new cotton hose was designed to replace linen firehose, of which there was a threatened shortage. A com. hydroxy ethyl ether of cellulose was used as the swellable agent in this study. The method appears applicable to any cloth construction intended to utilize the principle of swelling."—Chem. Abs. 39: 5080-5081.

520. KENNEDY, S. J. Problems for future quartermaster textile research. In Conference on Quartermaster textile research, Washington, D. C., 1945. Proceedings. p. 2-14. New York, Textile Research Institute, 1945. 304.9 C76

Reprinted from Textile Res. J. 15: 413-422. Nov. 1945. 304.8 T293

Project of "improvement of fabrics with respect to water resistance" discussed, with mention of the Southern Regional Research Laboratory's part in fundamental research of using the swelling properties in self-sealing (water-resistant) fabrics.

521. PEIRCE, F. T., REES, W. H., and OGDEN, L. W. Measurement of the water vapour permeability of textile fabrics. Textile Inst. J. 36: T169-T176. July 1945. 73.9 T31

"Information on the water-vapor permeability of fabrics... A volumetric method for measuring this property applied to variety of fabrics. Results of tests on 1, 2 and 3 layers of close woven cotton cloth show the additivity of water-vapor resistance. Water-repellent finish had no deleterious effect on the rate of evapn. Among fabrics of close texture there appears to be no correlation between air and water-vapor permeabilities. There is correlation between the resistance of a fabric and its thickness. All fabrics tested had greater resistance than still air of the same thickness. The equiv. air thickness of cotton fabric was roughly three times the fabric thickness."—Chem. Abs. 39: 5498.

522. PEIRCE, F. T. Watertight cotton fabrics. Canad. Textile J. 63(1): 36-37. Jan. 11, 1946. 304.8 C16

Also in Textile B. 69(5): 11-12. Nov. 1, 1945. 304.8 So82

Information on the wartime production of watertight cotton goods and technical data on their manufacture and use under peacetime conditions.

Abstracted in Rayon Textile Monthly 27(1): 78-79. Jan. 1946. 304.8 R21

523. SIMPSON, J. E. The army's water repellent clothing. Amer. Dyestuff Rptr. 35: 243-252, 272, 288-290. May 20, June 3, 1946. 306.8 Am3

"The article presents a panoramic view of the principal efforts and achievements in the development of water-repellent clothing, and the principal lines of investigation which the Army now thinks should be pursued. The highlights of the principal work undertaken, the institutions affiliated with each specific phase, and a brief discussion of laboratory test methods, field tests, and actual use experience of the various water-repellent clothing items is given."—Adapted from the Introduction.

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